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AMERICAN GAS JOURNAL

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Manufactured and Natural Gas

ROBERTSHAW

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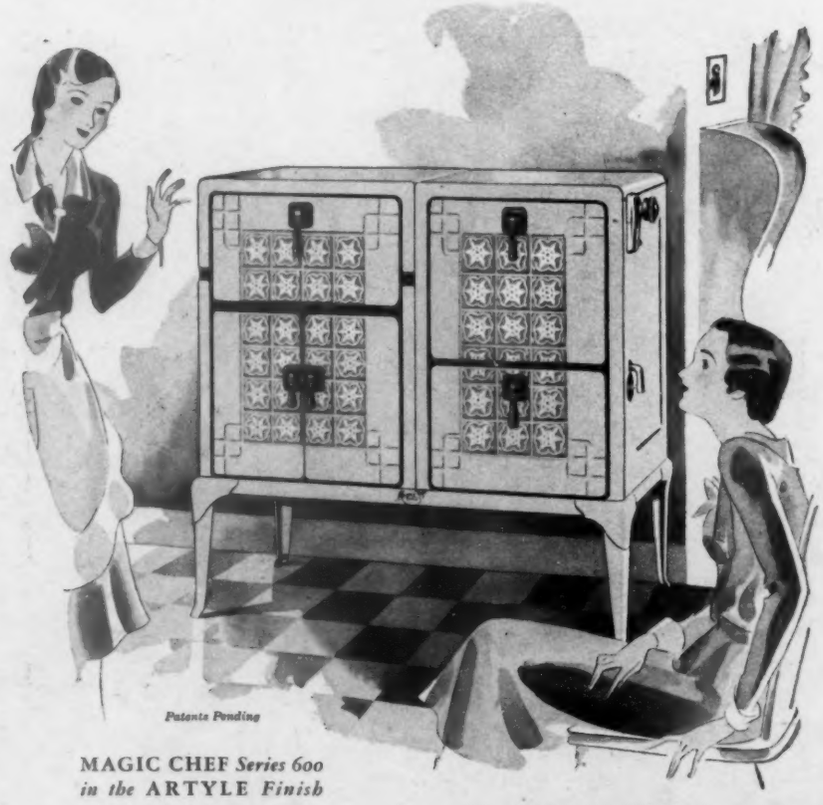

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AMERICAN
GAS JOURNAL
Established 1859 — *Pioneer of the Gas Industry*

Manufactured and Natural Gas

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53 Park Place, New York, N. Y.

JAMES T. HEED, *Advertising Rep.*
343 So. Dearborn St., Chicago, Ill.

NORMAN C. NOURSE, *Advertising Rep.*
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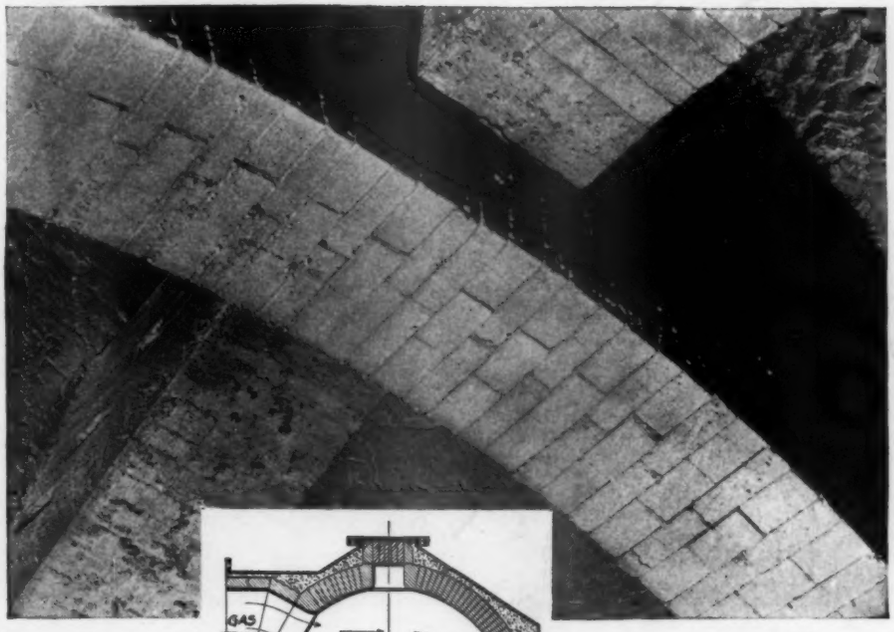

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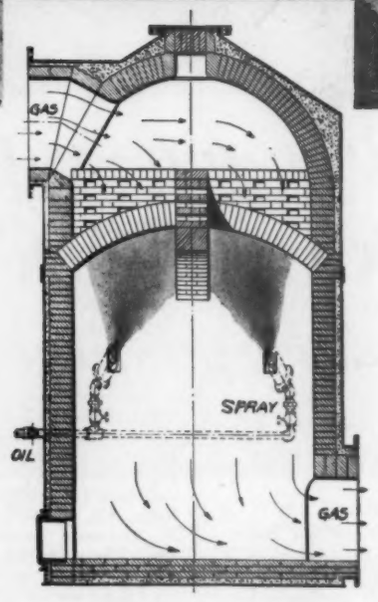

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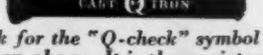

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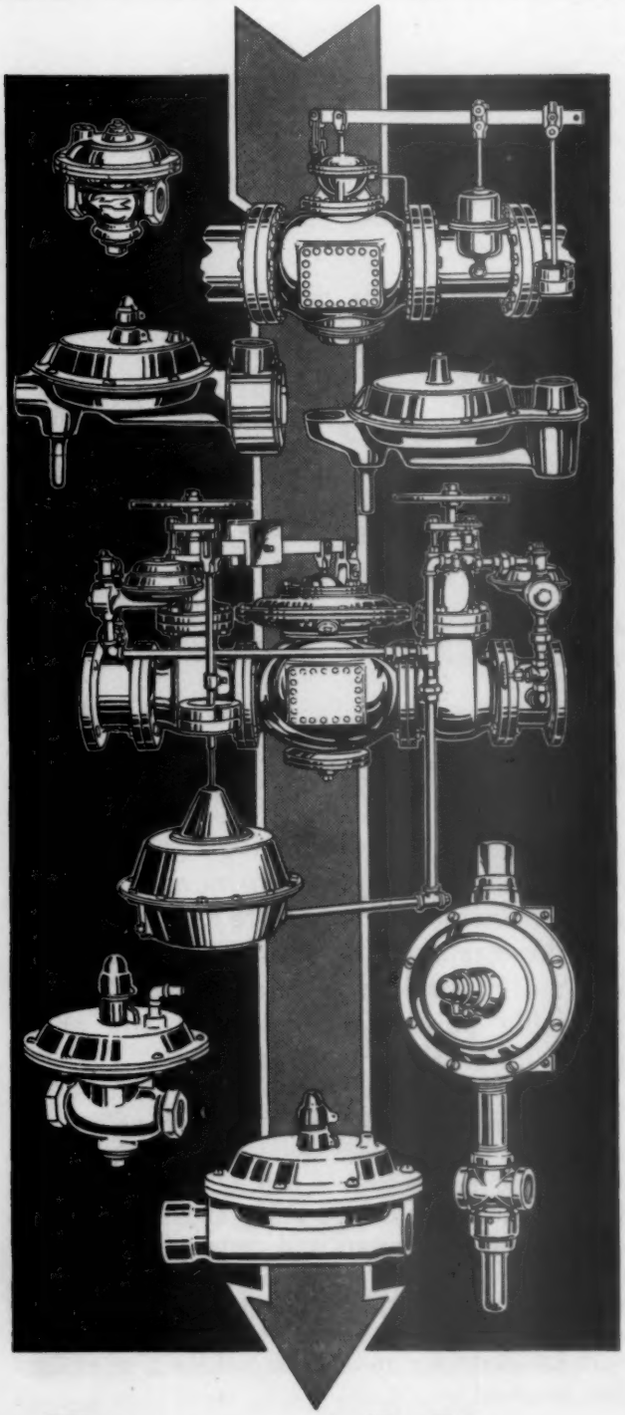
As long as there is a need for gas control regulation, just that long will the name Reynolds be symbolic of dependable, accurate gas control



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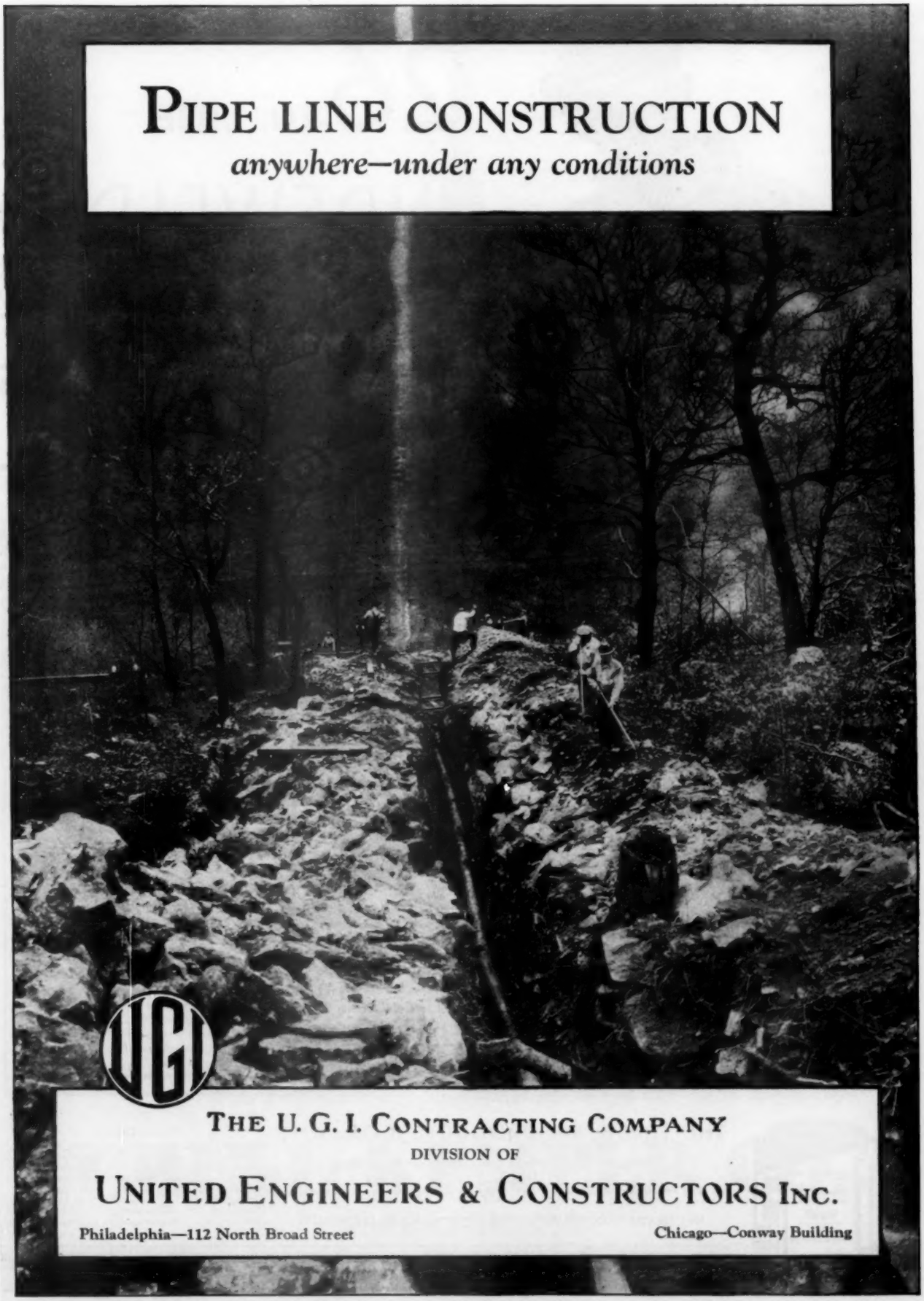

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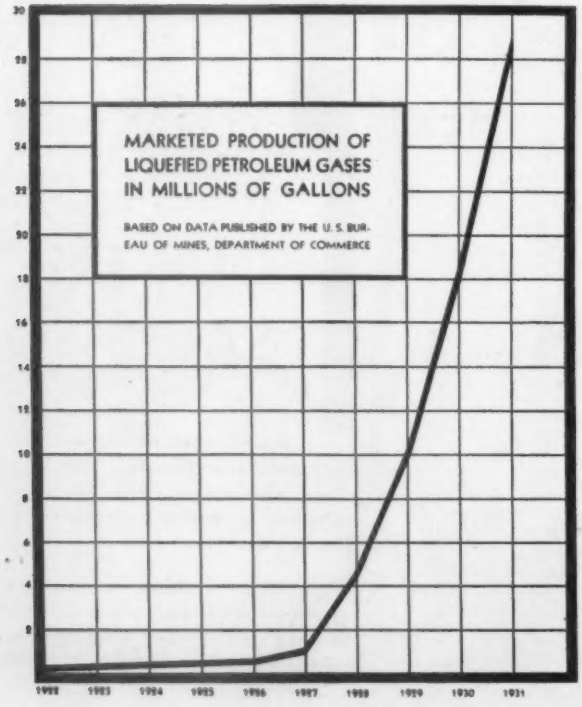
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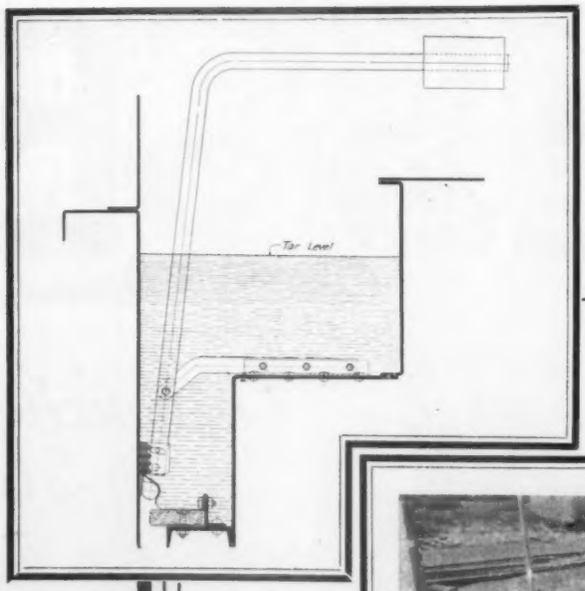

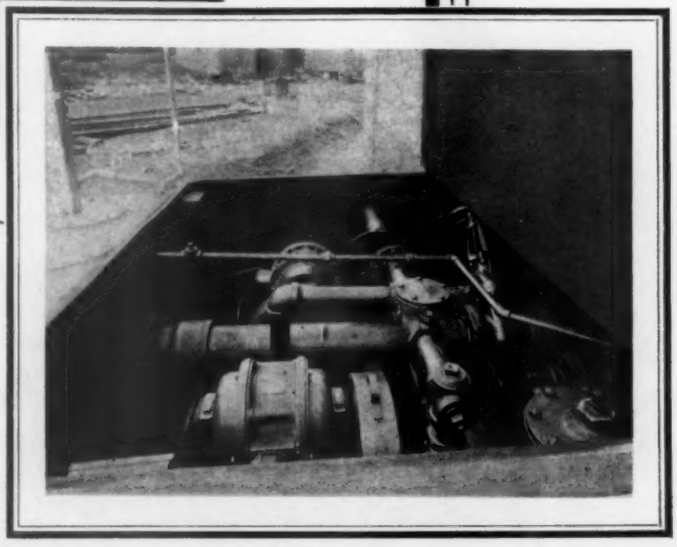

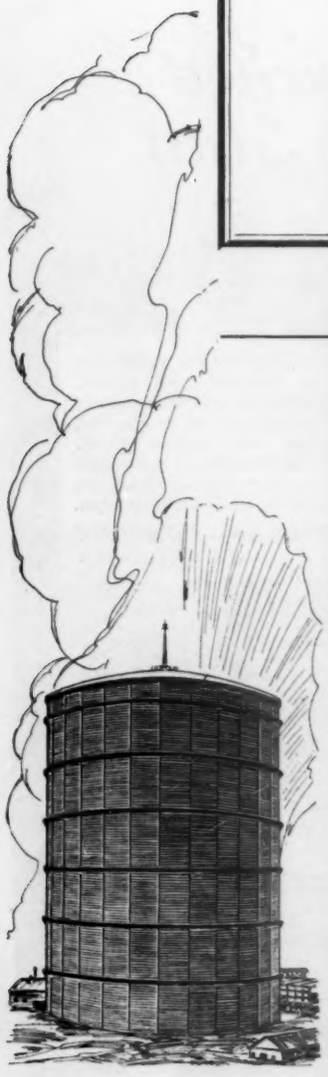

The success of the seal in the M. A. N. type Waterless Gas Holder, built exclusively in the United States by the Bartlett Hayward Co., is due to its simple design and construction.

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AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including GAS INDUSTRY Est. 1900.

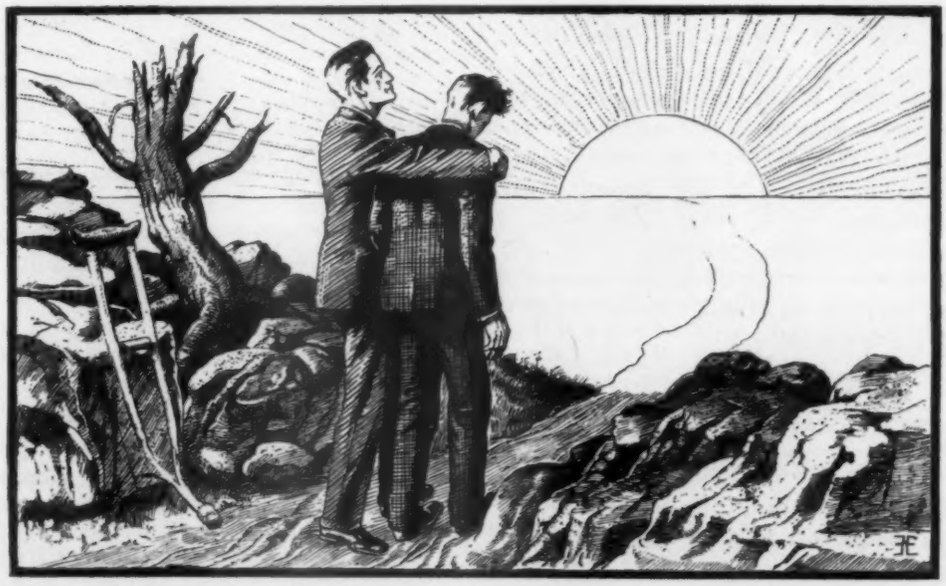
HENRY M. RILEY, Editor

The Counter-Attack

THE MOST DISTRESSING and demoralizing feature of the present depression is not the paring down of dividends and the lowering of profits to the vanishing point; nor is it the cutting of wages—it is the growing roster of the unemployed, which strikes at the morale of the employed and those out of work alike. Each successive wave of workers laid off has been like the retreat of a beaten and harried army.

But the recently inaugurated campaign sponsored by American Federation of Labor, American Legion and a host of other organizations, to find work for one million unemployed, proclaims the zero hour for the counter-attack. And the gas industry must add its might and sinew to the movement to recover lost ground.

The question, can we find places for additional workers, must be answered affirmatively—and speedily. Granting that many companies have anticipated work during the past year to remedy the situation, it is possible that a careful study of the question will reveal that more can be done. The beneficial effect on business of the quick consummation of the movement is obvious. In the past the public has stood by us and made our industry great. Our place in the counter-attack would seem to be well up toward the front.



MAR 17 1932

March
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As We See It

Making the Gas Man Into a Tax Collector

IT IS SERIOUSLY proposed that a tax be placed on all gas and electric bills to be collected by the public-utility companies in order to eke out Federal income. From the standpoint of the Federal Government this proposal has such merit that the industry dare not ignore the threat. But from the standpoint of gas and electric companies the threat is a horrible one.

Every local utility company should exercise its full influence through appropriate organizations or directly with its local Congressmen or Senators to meet this situation. The members of Congress should be given to understand that gas, though nominally a monopoly, is intensively competitive with other fuel and energy sources. If Congress loads a tax of even a small percentage onto gas it will burden every user and it will burden gas in competition with other fuels very seriously. Unless Congress wants to put a tax on coal and oil it cannot justifiably put one on gas and electricity. Congress must recognize that these commodities are highly competitive and to load one without the other would be unfairly burdensome.

The magnitude of the threat shows how important this action will be. Originally the proposal was only a 3 per cent or 4 per cent tax. Now the proposal of the Treasury Department is a 7 per cent tax. Even though this is limited only to household customers it would be a very serious one. Mr. R. W. Gallagher, representing American Gas Association, has made an effective appearance before the Ways and Means Committee of the House of Representatives on this subject. Elsewhere in this issue the Journal prints substantially in full Mr. Gallagher's remarks. We believe that every member of the industry should study them and lend the full force of his influence in the direction indicated by Mr. Gallagher's able leadership.

Let's Not Be Stupid

ALL INDICATIONS point to a bit of rather strenuous competition for the cooking load; but only an ostrich-like thrusting of our heads into the sands of smug complacency, with the attendant blistering lambasting from the rear, can cause anything to our detriment.

Electric men have long looked at our cooking load with drooling chops and itching palms; however, only the most primitive stupidity on our part will satisfy either of these ailments and transfer the malady to our own persons. Every ethical constructive competition on the part of the electric range must be met in kind by the gas man. Close cooperation between the gas range manufacturers and the gas companies must prevail. As Mr. Frank Roberts points out, a widespread advertising and publicity campaign must be prosecuted, with all parties concerned united in a common cause. We must equip ourselves with the best type of salesmen available. Such men will have plenty of first class ammunition, as regards the recognized merits of the gas range from every angle, to bring in sufficient game without having to resort to the expedient of claims which smack of the miraculous. Further, the gas men themselves must keep their heads and not be frightened by a cloud which has the shape of a tornado but which houses a mere zephyr. And while zephyrs serve but to caress the virile oak, they have been known to wreak more than passing havoc with the down that is located close to a chicken's heart.

Let's not be stupid.

Utility Commissioners Air Conflict of Opinion

A GROUP of nine state public utility commissioners have communicated in an unusual way with their fellow members of the National Association of Railroad and Utilities Commissioners. These nine distinguished, in some cases nationally known, regulatory officials charge an undesirable situation within their Association. And the charges which they cite are of definite interest to the utility-company executive.

These commissioners ask that the national gatherings of their Association be taken out of the class of "junkets;" they fear that this designation has in some cases been justified. They ask that their Association meetings be limited to regulatory officials, with the exclusion of utility-company representatives. They suggest in the third place that the regulatory group cease to sponsor the Public Utilities Fortnightly and Public Utility Reports, two periodicals issued primarily with public-utility-company support.

This is not a case in which gas men need interfere with the state officials' association affairs. But the occasion does justify notice. It suggests that perhaps in their zeal some utility-company men have been unduly active in this regulatory officials' association. Neither these nine state officers nor anyone else, so far as we know, charges that there has been any underhanded or improper intent. Apparently a practice, innocent and simple and at the outset wholly harmless, has grown up to the point of giving some measure of offense.

Federal Taxes on Gas Consumers

Statement in opposition to the proposal of the Treasury Department

R. W. GALLAGHER

President, American Gas Association

THE serious problem which the committee faces is understood and appreciated by this association. At the same time we feel it desirable that the committee be advised of the pertinent facts concerning our industry before it takes any action on such a proposal as is now before it.

The gas companies of the country distribute gas to about 7,800 communities. Some distribute manufactured gas, some natural gas, and some a combination of the two.

The most recent reliable information that we have deals with the year 1930. At that time there were about 16,000,000 consumers. These consumers fell into two broad classes, residential consumers and industrial and commercial consumers. There were about 15,200,000 residential consumers, and about 832,000 industrial and commercial consumers at the end of 1930.

Each residential consumer, generally speaking, represents a family, so that out of approximately 30,000,000 families in the country, we assume that there were 15,000,000 families using gas or approximately 50 per cent of the total number of families.

The total revenue taken in by the gas companies in 1930 was approximately $803,600,000. Of this, approximately $568,000,000 represents revenues from residential customers, and $235,600,000 revenue from industrial and commercial customers.

The residential customers, as you may know, use gas in three principal ways, for cooking, for water heating, and for house heating. In the commercial and industrial field, gas is used for all purposes where heat is required, and is in competition with all other fuels. Even in residential use, gas is subject to competition with other fuels when it is used for house heating, and this is also true in considerable measure when it is used for water heating. On the other hand, gas for domestic cooking, which began long ago as a convenience and labor-saving device, has now developed into an economic necessity. The fact that a family cooks with gas does not indicate that it is any higher in the economic scale than a family that does not, but merely that it lives in a location where gas is available.

At this point I would like to suggest that when Mr. Hagenah was talking, some member of the committee suggested that people using gas were in a different class from those not using gas; in other words, gas was not used except by people having a substantial income. The facts are that in our locality—and I take it our case is representative of other communities—there are 1,200,000 inhabitants and 300,000 customers on our lines. This indicates that in our community, generally speaking, four people as a rule represent a family. I think, therefore, you can assume that gas is used universally in districts where gas is available—not by any one or more particular classes of people but by all classes.

There was another point brought up during Mr. Hagenah's discussion this morning which I would like to touch on. That was to the extent that a tax which might be imposed by the Government upon the use of electricity would affect the individual consumer. Figures were mentioned which represented the average amount of electricity sold and the average bill paid per consumer for a year. In that connection I would like to call your attention to the fact that, peculiar as it may seem, the man who pays the highest gas bill is not necessarily the well to do man. Most of the cities have a large percentage of apartment houses. People living in apartments, in so far as the gas industry is concerned, are the smallest consumers. For example, in an apartment having 100 suites, the average consumer may use 1,000 feet of natural gas, or a somewhat larger amount of manufactured gas, a month, whereas the mechanic or day laborer who lives in a house and uses gas for cooking or winter heating has bills which run up to $4 or $5 a month in the summer, and in the winter, when he is using more gas for heating, his bill often goes to $6, $8, or $12 a month. The man with the smallest gas bill, in other words the apartment hotel dweller, is not the poor man. The really poor man usually has a rather substantial gas bill. This is a fact that is well understood by all men in the gas business. It is hardly known or appreciated at all outside the gas business. It is a fact that this committee should know and should keep steadily in mind, for it means that a tax added to the gas bills on a percentage basis would bear most seriously on those people least able to pay it.

An excise tax upon the use of gas, as applied to the use for industrial purposes, where the gas is in sharp competition with other fuels, would immediately have the effect of causing large numbers of such customers to turn to other fuels. This would, to that extent, simply defeat the purpose of the tax. Moreover, it would have an immediate and very bad effect upon the

A Worthy Cause

Appearing before the Ways and Means Committee of the House of Representatives, Mr. R. W. Gallagher, President of A.G.A., made a very effective statement opposing the proposal of the Treasury Department that a Federal tax be levied on gas bills. We believe that every member of the gas industry should consider this subject and lend his vigorous support to Mr. Gallagher's presentation.

—Editor.

gas industry, and, through it, upon the other customers who are not in a position to turn to such other fuels.

Generally speaking, the economic situation of a gas company is this: It designs and builds its plants and other facilities of such capacity as will take care of the requirements of its residential customers. These customers make heavy demands upon the facilities at certain times and light demands at other times. The facilities must be built large enough to take care of the heaviest demand. The gas companies have for years been engaged in an effort to utilize their plant facilities during such periods of light demand to supply gas to industries in competition with other fuels. By doing this, they have realized additional earnings which have resulted in lower rates for residential consumers. In order to maintain the revenue required to carry their plants, the company would be obliged to retrace their steps and begin increasing residential rates for gas. They would have no option in the matter, since they are obliged to have enough revenue to carry plans and facilities large enough to meet the greatest demands of the residential customers, whether or not they have any industrial customers. The levying of such a tax, therefore, would ultimately result in adding to the burdens of those customers still taking gas, by increasing their rates.

Those customers, of course, would, in addition, themselves have to pay the tax imposed upon them. The loss of industrial customers as a result of such a tax is not an imaginary condition. The gas companies at the present time, even without such a tax, are having the greatest difficulty in holding their industrial customers in competition with other fuels, which are very low in price. So close is the margin that in many cases the slightest addition to the cost of gas to the customer would result in his turning to competitive fuels.

In the Middle West these conditions are very aggravated. Fuel oils are selling as low as 2 cents a gallon, and coal is selling, as a manufacturer in Youngstown recently remarked to me, at prices named by the purchaser, and so the gas company is having a most difficult time in maintaining the small amount of industrial business, still left in its lines, which, as you may well imagine, due to present business conditions, is small compared to the amount in its lines in, say, 1929.

As applied to a customer taking gas for residential use, the effect of such a tax would depend largely upon what portion of his use is for house heating and water heating. A residential customer using gas not only for cooking but also for heating would in many cases be influenced in just the way as the industrial customer—that is, with the present extremely low prices of other fuels, he would discontinue the use of gas for house heating and turn to other fuels for that purpose. In most cases he would continue to cook with gas. The difficulty in practically every home of finding a substitute for gas for cooking is not the case with gas for heating, where it is comparatively easy to convert over quickly from the use of gas to coal or some other fuel. The point is that the heating load is very easily affected by any changes in price. Just as in the case of gas for industrial use, gas for house heating is in sharp competition with other fuels, with their present low prices, particularly coal, coke, and oil. In many communities, even without the additional cost which would be created by such a tax, the companies are having the greatest difficulty in holding and in some cases are actually losing their house-heating customers, this being due to the extremely low cost of other fuels and the keen competition resulting therefrom. To the extent that such a tax would bring this result, it would again defeat its own purpose, and it would in addition force upon the remaining customers the burden of furnishing the necessary revenue to enable the gas company to continue to give the service. It is not certain in many situations that the company as a practical matter could by any readjustment of its rates recover the full amount of the revenue which would be lost to it in this way.

STATISTICAL BASE FOR TAX ON GAS USAGE

The following statistical statement was prepared for the House Ways and Means Committee by W. F. Collins, of the Federal Trade Commission, assisted by statistical specialists of the U. S. Geological Survey and the Bureau of Mines. On the basis of this it is estimated by Mr. Collins that a tax of 5 per cent would result in Federal income of approximately $46,860,000, of which $20,780,000 would be from natural gas and $26,080,000 would be from manufactured gas.

Natural Gas

	Domestic	Commercial	Industrial	Total
Revenue ($)	205,878,000	33,295,000	176,346,000	415,519,000
Gas sold (M cu. ft.)	305,241,000	71,166,000	1,565,237,000	1,941,644,000
No. of customers	5,095,000	.....	21,000	5,469,000
Consumption per year per customer (M)	60	201	74,535	355
Consumption per month per customer (M)	5	16.80	6,211	30
Cost per M (cents)	67.4	46.8	11.3	21.40
Annual cost per customer ($)	40	94.07	8,422.45	76.97
Monthly cost per customer ($)	3.33	7.90	701.90	6.40

Manufactured Gas

Separation between classes of customers based partly on estimates derived from returns of 150 companies doing about 70% of business of the industry.

	Domestic	Commercial and Industrial	Miscellaneous	Total
Revenue ($)	417,000,000	102,600,000	2,200,000	521,700,000
Gas sold (M cu. ft.)	390,000,000	129,200,000	3,000,000	522,900,000
No. of customers	11,600,000	540,000	8,730	12,134,000
Consumption per year per customer (M)	33.64	239	343.64	43
Consumption per month per customer (M)	2.80	20	28.64	3.60
Cost per M (cents)	1.07	80	73.33	99.8
Annual cost per customer ($)	36.00	191.20	252.00	43.00
Monthly cost per customer ($)	3.00	16.00	21.00	3.60

I may add a word here, while we are talking about residential consumers, about the conditions in the larger cities as compared with conditions in smaller communities, and whether this would be a tax upon a luxury or upon a necessity of life. We know that there are at this time some 85,000 people out of work in Cleveland. I think that is a very conservative estimate. Every one of those people is nevertheless using gas for cooking. It is the only means that they have of preparing food. Many of them, under the stressed conditions now prevailing, are using gas for heating, because they have not the money to pay for solid fuels. If they were to buy solid fuels, the seller would require that they pay in advance, with the result that they turn to the only method of heating available, gas, and huddle around the kitchen stove to keep warm. It so happens they may use gas for 30 days before the meter is read; another 10 days pass before the bills are sent out; another 10 days elapse before a collector calls. The result is that these particular consumers are in arrears at least 50 days before the company has knowledge of their condition and then the collector finds that many of them are in dire straits without sufficient food and clothing and often finds even the children in a pitiful condition. In very many cases during the last year employees of our company have made personal contributions to help the most urgent cases reported through the company's collectors. In a great many cases it has been necessary for the charities of our communities through the community chest and from other available funds to help these unfortunate people. In many other cases where the customers always paid their bills promptly the gas company is carrying these accounts, hoping that work will be found by the man in arrears and that he will gradually reduce his indebtedness. Does this not indicate that gas is a necessity and not a luxury? Would you say that these people should be burdened with an additional tax contribution such as is here proposed?

As applied to these residential customers who would not be driven to other fuels but would be forced to pay the tax, that is, the cooking customers, it would not be a general sales tax upon all the people; neither would it be a selective sales tax upon certain specified luxury articles such as has been imposed by the Federal Government in the past. It would be a selective sales tax upon a limited group of these people, mostly wage earners, taxing them for the right to cook their meals, one of the necessities of life. At least one-half of the people, those who cook with other fuels, would be exempted from the tax.

In other words, this would be the first time that the Federal Government has ever attempted to impose upon a limited class of people a sales tax upon a necessity of life. Before any such action is taken, it is not only the right, but the duty of the American Gas Association, to point out to this committee just what such action would amount to and the precedent that it would establish.

The injustice caused by such a tax could be obviated only by levying a comparable tax upon all other fuels. This would be the only way the gas companies could maintain their present sales and the only way in which the injustice to those using gas could be corrected. Unless this were done, the gas companies, in addition to the burden which would be placed upon them of collecting such a tax on behalf of the Federal Government, would find their business impaired, and the results of the efforts which they have been making for many years nullified.

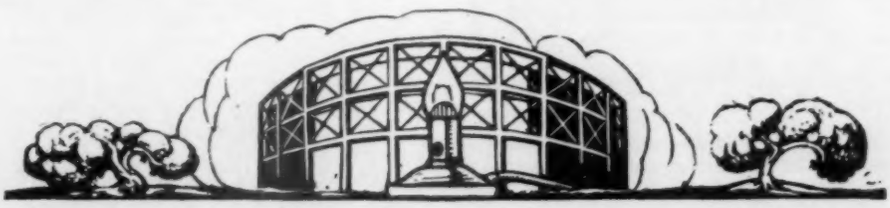
I do not see how the imposition of such a tariff could be considered consistent with what I understand to be the purposes of this committee. It is my understanding that the suggestions made to Congress by the Secretary of the Treasury had for their purpose the broadening of the base of taxation by reducing the income tax exemption and reaching more people, and the imposing of certain limited excise taxes. Even in those suggestions, considerable income tax exemptions were retained, and the people of the smallest means were not intended to be reached, and the proposed excise taxes were to be only on specified luxury articles. The imposition of this excise tax on the use of gas would burden the very class of people whom the Treasury Department intended to omit from Federal taxation, that is, people with small means. Worse than that, it would select out of that class a particular group, comprising only half of that class, while exempting the other half; and, in addition to the tax itself, these people would as a result of the tax soon find themselves subjected to an increase in the cost of the gas itself, for the reasons which I have stated.

The committee should bear in mind that the users of gas are already indirectly paying taxes as such users, and that a part of the taxes they pay consists of a Federal tax. The taxes paid by the gas companies in 1930, and necessarily covered by them in their bills to their customers, were such that the average user of manufactured gas paid $4.25, and the average user of natural gas $3.96, and about one-quarter of these amounts were Federal taxes. Out of every dollar paid for gas by the gas consumers in 1930, 8.7 cents represented taxes.

If I judge correctly the purposes of this committee, it is not their intention to tax the food necessities of life. Yet I find no way of distinguishing between the actual food which people must have for sustaining life, and the fuel which they must have to prepare such food. In fact, it seems to me that it would be just as proper to tax bread as to tax the fuel which is necessary to bake it. Gas can not certainly with any stretch of the imagination be classed as anything but a necessity of life.

Finally, I would like to call the committee's attention to the very pertinent fact, in connection with the proposed tax on electricity and gas, that the greater part of the consumers are using both commodities, and that the taxing of both would be a double burden on these consumers.

I do not see how it would be justifiable to tax this particular group of people further for the support of the Federal Government until other people in the same economic group are subjected to similar taxes.



A Simplified Apparatus For Determining The Deviation of Gas From Boyle's Law

PHILIP E. BECKMAN

Dept. of Gas Construction and Operation
Pacific Gas and Electric Company
San Francisco, Calif.

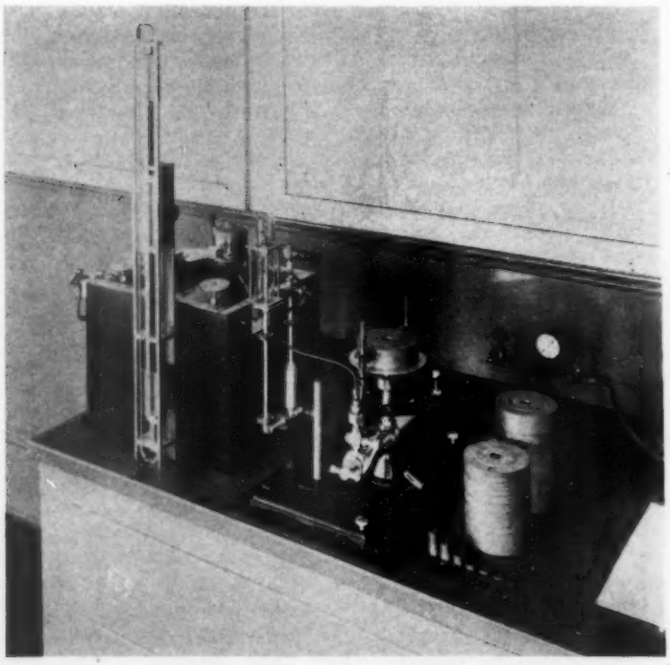


Fig. 2—Complete Assembly of Deviation Apparatus

WITHIN the past two years the writer has been associated with the construction and operation of a Bureau of Standards' type of instrument* for testing natural gas for its deviation from Boyle's Law. Although the instrument has functioned satisfactorily, a desire to simplify the equipment and operation has persisted, resulting in the development of an apparatus which differs from the Bureau of Standards' type in design but which conforms in principle.

In both apparatuses a volume of high pressure gas is expanded and metered at or near atmospheric pressure, the ratio of the metered gas volume to that expanded volume indicated by Boyle's Law obtaining a super-expansibility index or deviation factor. Both procedures require several steps for the expansion of the sample; consequently, a series of observations during a declining sample pressure furnishes data for factors at various expansion ratios, permitting a curve to be drawn —deviation versus pressure. Observational errors thereby tend to balance and the absence of vapors from foreign liquids is indicated by a locus of fairly constant curvature directed toward the origin of the axes.

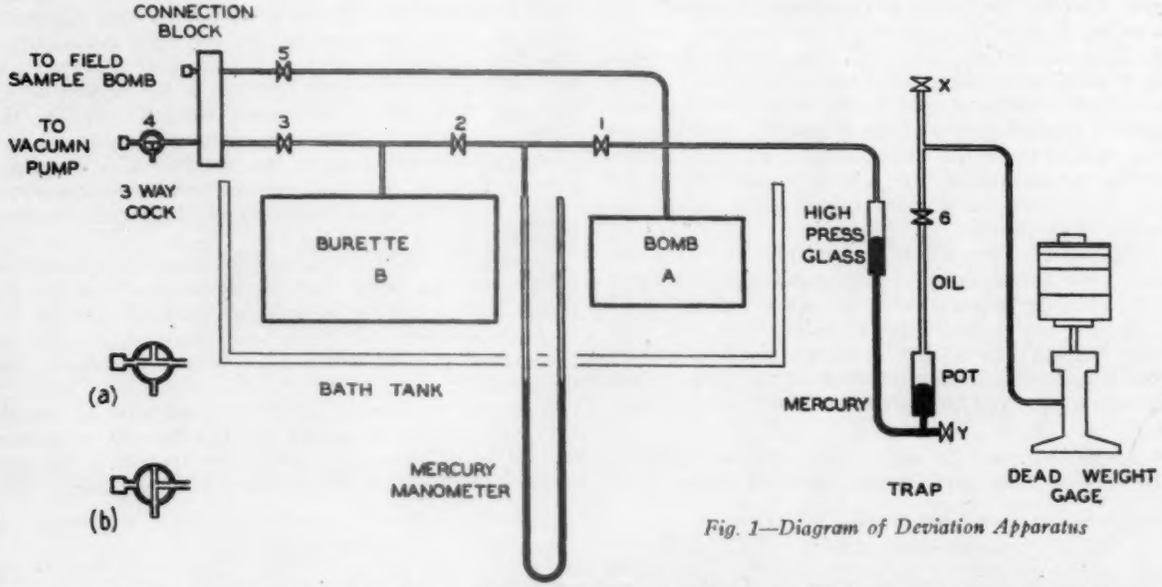


Fig. 1—Diagram of Deviation Apparatus

The qualifications of equipment for measuring the super-expansibility of gases are strict. The apparatus must be absolutely leak proof and unaffected by moisture. Since natural gases in the field are metered within a

**An apparatus and method for determining the compressibility of a gas and the correction for super-compressibility. H. S. Bean, U. S. Bureau of Standards Journal of Research, R. P. 170, Vol. 4, 1930, Page 645.*

wide temperature range, flexibility of temperature adjustment is desirable and a common isothermal condition must be applicable to both expansion and measurement of the sample. Ordinary metering equipment familiar to the gas industry is unsuitable for incorporation in the instrument due to the impracticability of accurate temperature regulation, to insufficient accuracy, or to the effect of meter liquid vapors.

The Bureau of Standards' apparatus meets all necessary qualifications but is very fragile, being built of glass. Extreme care must be exercised during each cycle when displacing some thirty pounds of mercury with high pressure gas. At high temperatures grease from the three-way glass cock fouls the mercury; unless it is frequently cleaned readings are taken with difficulty through the tank windows and bath water. Since the cock often must be greased between tests and the bomb disconnected when introducing a new sample, the bath must be drained and the parts thoroughly dried or the inclusion of water vapor will affect subsequent tests. Such servicing occasions the loss of considerable time.

The apparatus to be described is unbreakable, being almost entirely constructed of metal. No observations are made through water, the bath need not be drained between check tests and no cleaning or servicing is necessary. The apparatus speeds up tests, is well suited for extreme temperatures in wet gas testing and can be conveniently operated by one man. No displacing liquid is used in the metering burette; a differential between partial evacuation and repressuring indicates the volume metered. Where especial convenience is unnecessary, due to only occasional use, this apparatus may be modified to permit its construction at a very low cost.

Acknowledgment is given to Mr. Frank Wills for his assistance in offering many suggestions for a clearer presentation of the subject of this paper.

Description of Apparatus

The apparatus consists of one high and one low pressure steel cylinder, a mercury manometer, four needle valves, one three-way metallic cock, a water bath and a mercury-oil trap. Accessories include a piston gauge and a vacuum pump which is preferably of a motor driven high vacuum type, although a water filter pump can be used. See Figure 1.

The steel bomb (A) and burette (B) are of solid steel construction with but one outlet each, the bomb having especially heavy walls. A simple frame work supports these in the bath. The manometer, a capillary "U" gauge type, is so designed for this particular apparatus that full differentials, 0 to ±6 inches and 27 to 31 inches, may be obtained with one setting. This is accomplished by two independent scales upon a single gear rack, each being provided with typical barometer sights and graduations and adjusted by knurled wheels. A 3 m.m. capillary has been found suitable, a lesser diameter detracts from the differential accuracy, a greater increases the apparatus' errors.

The needle valves are of stainless steel rebuilt with bronze seats and mounted on the bath tank with bonnets above water. The wooden, copper lined tank with overflow is windowless and supports both the manometer and mercury-oil trap. The trap is of the type introduced with the Bureau of Standards' apparatus except that a pot is inserted at the mercury oil juncture. This has been added to reduce the travel at this point and prohibit oil from being wiped into the high pressure glass. The reader is referred to H. S. Bean's paper for a complete description of the mercury-oil trap and its manipulation.

The bomb is permanently connected in the apparatus. On the outside of the tank, firmly fixed, is a steel block having two pipe connectors, one for filling the bomb with a high pressure gas sample and the other for evacuating the burette. Bath and manometer thermometers, a motor stirrer and an electric immersion heater complete the apparatus.

Operation of Apparatus

At the beginning of a test all valves are closed except numbers 1, 2 and 3; valves x and y are permanently closed, being used only when setting up the trap originally. The bath having been filled and brought to the desired temperature, the whole system is evacuated with cock 4 in position (a). Valves 1, 2 and 3 are then closed and the cock turned to position (b), maintaining a vacuum on the pump but venting the connection 3-4. The field sample bomb is connected to the block filling connector and the tubing purged. Valve 5 is cracked and the bomb filled after which valve 5 is closed for the remainder of the test.

This procedure applies when evacuation has been carried to less than one millimeter. When using a filter pump the bomb should be purged once before the final filling by bringing up to full pressure and releasing.

The field sample connecting tubing is disconnected and to this block connector a short length of copper tubing attached. The end of this tubing may then be wetted with soap solution and the tightness of valve 5 checked without danger of moisture entering the equipment and affecting the following test. The tightness of valve 1 is checked by observing the manometer; the volume included between valves 1 and 2 is so small that the slightest leak will cause a change in the manometer. Valve 6 can now be opened and a piston gauge reading taken. Valve 2 is then opened and the burette pressure adjusted to about a 28″ vacuum by valves 3 and 4, the manometer being watched momentarily for evidence of leaks in the burette system. Valve 1 should next be opened and the burette pressure raised to about one atmosphere after which valve 2 is closed for an instant to check the tightness of valve 1.

The pressure of the gas in the burette having been recorded, cock 4 is set to position (a), valve 3 is opened and the burette evacuated to about 28 inches. Valve 3 is again closed and a manometer and piston gauge reading taken to be followed by valve 1 being opened and gas withdrawn from the bomb. This procedure is continued until the bomb pressure has been reduced to about one atmosphere. The final bomb pressure is observed upon the manometer since burette and bomb pressures are then the same.

The high pressure volume includes all spaces between valves 1 and 5 and the low pressure between 1 and 3. Valve 2 is used to check valve 1 only. Cock 4, by venting one side of valve 3, permits a manometer check on the burette system while still maintaining a vacuum on the pump. A manometer of the type described is particularly convenient for these checks since the sight setting eliminates scale readings.

Great care must be used in choosing valves 1 and 5, for the seats must be leak proof. Being installed so as to have the bomb pressure under the seats, no trouble need be expected with the bonnets. Leaks in the burette system are improbable because of the low differential of 14 to 15 lbs. per sq. inch and since the vacuum is held but an instant after the manometer reading is taken.

Water must not enter any part of the gas system. All connections must be absolutely tight, particularly since the burette is under a vacuum. For this reason all valve bonnets are above water, so that rotation of the stems may not permit its introduction. A leak in the bomb system, of course, is evidenced by bubbles in the bath; the burette system may be similarly checked by placing it under pressure. If water has entered the gas system it may be removed by prolonged evacuation. A high vacuum pump is most suitable for this purpose. With filter pump operation the bomb, burette and connections had best be removed and heated to dispel the water

The ratio of burette to bomb volumes in the described apparatus is about four. A test starting at 500 lbs. per sq. inch initial pressure is therefore completed in ten cycles. The water in the bath is not changed between runs except when temperature changes are desired. Only ordinary care need be exercised in manipulation, since no breakage can occur if valve 1 be suddenly opened. Should this happen, nothing more serious than the loss of the manometer mercury would result.

The burette should be evacuated to approximately 28 inches each cycle, the maintenance of a certain value consistently for all cycles being preferable. It should be filled to atmospheric pressure, or less, never greater. The basis for these rules of procedure will be justified later.

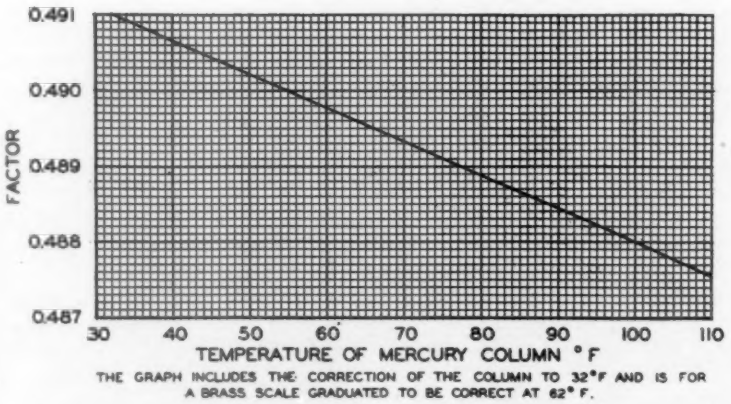


Fig. 3—Factors for Converting Inches of Mercury at Various Temperatures to Pressure in Lbs. per Sq. In.

Apparatus Formulae

Let V_H refer to the volume of a given weight of gas at a pressure of P_H, V_L to its actual volume after expanding to a lower pressure P_L, and V_{LB} to the volume it would have occupied at P_L had the change conformed to Boyle's Law. Then, according to Boyle's Law:

$$\frac{P_L V_L}{P_H V_H} = 1$$

Seldom is this statement a fact. Natural gas, being super-expansible under ordinary conditions of pressure and temperature, exhibits for this ratio a value greater than unity.

$$\frac{P_L V_L}{P_H V_H} = Y = \text{the super-expansibility deviation factor}$$

Since $P_H V_H = P_L V_{LB}$

$$\frac{V_L}{V_{LB}} = Y \text{ (for expansion from } P_H \text{ to } P_L)$$

With the deviation apparatus the actual volume V_L is obtained directly by metering while V_{LB} is calculated by applying Boyle's Law to the change of the volume at high pressure to a volume at low pressure.

The object in conducting a test, therefore, is to evaluate the following expression for Y.

$$Y = \frac{\text{Gas at } B_s \text{ in Bomb actually accounted for}}{\text{Gas at } B_s \text{ in Bomb according to Boyle's Law}} \quad (1)$$

Since several burette fillings are made to remove the high pressure gas from the bomb, it is possible to determine Y for various expansion ratios. Taking bomb pressures previous to each burette withdrawal completes the data for intermediate bomb pressures as well as for the initial pressure.

Wherever possible the nomenclature chosen by H. S. Bean has been employed.

Let V_a = bomb volume in cubic units
V_b = burette volume in cubic units
B_s = barometric pressure, lbs./sq. in. absolute
P_a = bomb pressure, lbs./sq. in. absolute
P_x = burette pressure, lbs./sq. in. absolute after evacuation
P_b = burette pressure, lbs./sq. in. absolute after filling
Y = super-expansibility factor, the value of which is unity when $P_a = B_s$

The gas contained in the bomb previous to any withdrawal, when expanded to pressure B_s according to Boyle's Law, occupies a volume equal to

$$V_a \frac{P_a}{B_s} \quad (2)$$

The gas metered at each step by the burette amounts to

$$V_b \frac{P_b}{B_s} - V_b \frac{P_x}{B_s} \quad (3)$$

At the last or (n^{th}) step gas still remains in the bomb at the same pressure as that in the burette so the gas accounted for in that measurement is equal to

$$\frac{V_b (P_b - P_x)_n}{B_s} + \frac{V_a (P_b)_n}{B_s} \quad (4)$$

The total gas accounted for from the beginning of a series of steps down through the last step includes all the successive volumes measured in the burette plus the residue in the bomb as expressed by equation

$$\frac{V_b}{B_s} \sum_n^k (P_b - P_x) + \frac{V_a (P_b)_n}{B_s} \quad (3) \quad (5)$$

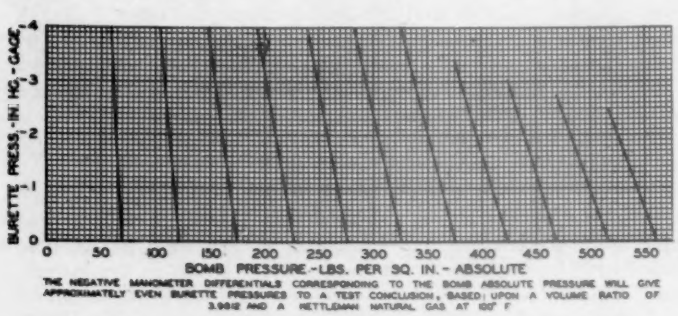


Fig. 4—Burette Pressures Completing a Whole Number of Cycles

where (k) represents any step before the n^{th} or last withdrawal.

Dividing equation (5) by (2) an expression equivalent to equation (1) is obtained.

$$(Y)_k = \frac{R \sum_n^k (P_b - P_x) + (P_b)_a}{(P_a)_k} \quad (6)$$

where $R = V_b/V_a$, the ratio of the burette to bomb volumes.

Formula (6) is applied to observations taken on the apparatus to compute the deviation factors at various pressures. A typical deviation test tabulation is shown in Table (1).

$$\text{Inches Hg, gauge} = 2.04 \frac{P_a Y + SRP_x}{SR + 1} - B_a \quad (8)$$

where $R = 3.9812$, $P_x = 0.982$, $B_a = 14.73$ and $P_a Y$ is the product of deviation and pressure for a typical Kettleman gas at 100°F. as taken from an actual deviation curve. The constant 2.04 converts lbs. per sq. inch to inches of mercury at 70°F. A similar graph may be used on a variety of gases and temperatures with sufficient accuracy.

Calibration of Apparatus

An examination of equation (6) reveals that neither the burette nor bomb volumes need be known, the value of their volume ratio alone sufficing. Actual measurement of the volumes has proven unsatisfactory since, obviously, it is necessary to include accessory tubing, valve spaces, etc. Too, such a laborious procedure might necessarily be frequently repeated due to changes or repairs.

A method for determining the volume ratio directly has been in common use for some time although no published data have heretofore been available. With this method excellent results have been obtained. Its application has assured the participants in joint tests involving two or more gas companies, of the accuracy of a calibration.

The volume ratio R may be determined from test data on dry air, free of CO_2 and any vapors. The deviation of air is accurately known, having been checked by several competent physicists. It follows that the air deviation factors may be applied to their corresponding pressures, the order of computation in effect be reversed from the usual deviation test and several values of the ratio derived, from which an average can be chosen. By this method each cycle gives a separate determination; no summation is involved.

The air is drawn from its source through a steel tube containing sodium-calcium hydrate, the absorption of CO_2 and H_2O carried on under the source pressure. For a supply the writer has used an oxygen cylinder filled with air to a pressure of 2000 lbs./sq. in. The test air is introduced to the apparatus at a maximum pressure of 400 lbs. per sq. inch. Such high pressure is convenient although unnecessary as the tests might be repeated several times with air at a lower pressure.

(Continued on page 34)

TABLE (1)

Deviation Factors for Dry Gas from P. G. & E. Compressor Station at Kettleman Hills

Test made at P. G. & E. Laboratory, S. F., Nov. 18, 1931—Sample taken Nov. 11, 1931 at 4 P. M.

Av. Barom. 30.37 in. at 78° F. Manom. at 78° F. Bath Temp. 80° F. R = 3.9812

Step	(1) P	(2) M_x	(3) M_b	(4) M_x-M_b	(5) P_b-P_x	(6) $\Sigma(P_b$-$P_x)$	(7) $R\Sigma(P_b$-$P_x)$	(8) P_t	(9) P_a	(10) Y
1	340.62	27.99	—1.72	26.27	12.845	91.097	362.670	377.338	355.469	1.0615
2	294.97	28.12	—1.49	26.63	13.021	78.252	311.533	326.201	309.819	1.0529
3	247.90	27.99	—1.69	26.30	12.859	65.231	259.694	274.362	262.749	1.0442
4	200.67	28.08	—1.09	26.99	13.197	52.372	208.501	223.169	215.519	1.0355
5	151.33	28.03	—1.38	26.65	13.031	39.175	155.962	170.630	166.179	1.0268
6	101.85	28.08	—2.30	25.78	12.605	26.144	104.083	118.751	116.699	1.0176
7	53.14	28.06	—0.37	27.69	13.539	13.539	53.901	68.569	67.989	1.0085

$B_a = 30.37 \times 0.48895 = 14.849$

$(P_b)_a = 14.849 - (0.48895 \times .37) = 14.668$

P = bomb gauge pressure, lbs. per sq. in., M_x and M_b = manometer in inches Hg after evacuating and after filling the burette respectively, $P_b - P_x = 0.48895\ (M_x - M_b)$ in which the constant is a factor taken from Figure 3 for converting inches of Hg at the manometer temperature to lbs. per sq. inch, Col. (6) is a summation of column (5) beginning at the seventh step, Col. (7) is the apparatus volume ratio (R) times Col. (6), Col. (8) (P_t) is Col. (7) plus the final bomb pressure $(P_b)_a$, Col. (9) (P_a) is the bomb absolute pressure = P + barometric pressure and Col. (10) (Y) is Col. (8) divided by Col. (9), the deviation factor.

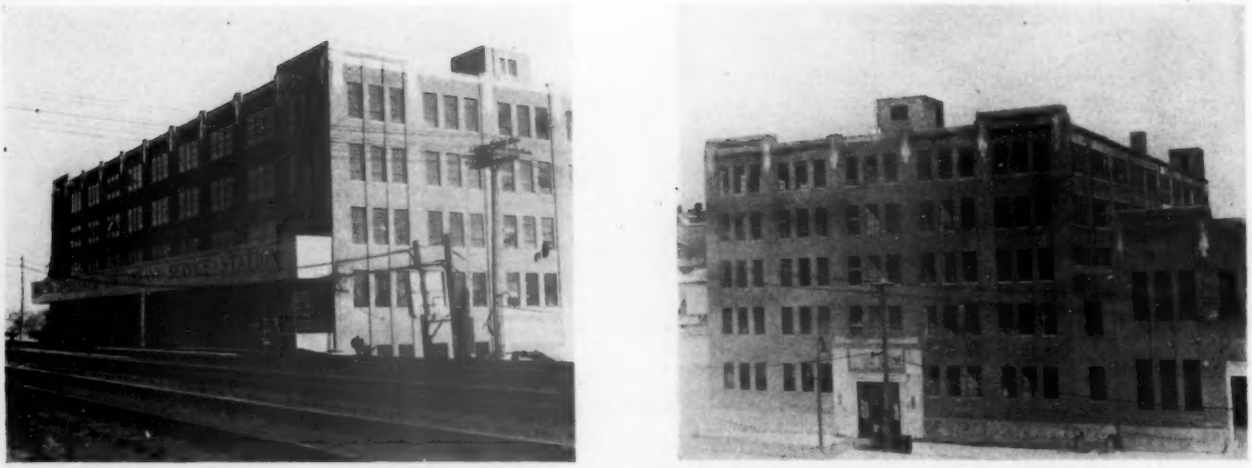
Constant atmospheric burette withdrawals result from coincidence only; as with the Bureau of Standards' apparatus a portion of a step must usually be gained due to an unsuitable starting pressure. It is desirable that provision for this be made from the beginning. One method is to divide the remaining gage pressure by the preceding drop in pressure, noting whether the number for the remaining steps is a whole number and, if not, adjusting the following steps by withdrawing gas at a pressure less than atmospheric. This rule is often confusing since the apparent correction does not remain constant, necessitating frequent checks. Another method which saves time is applicable.

If the summation sign in equation (6) be replaced by the number of steps, S, and the equation solved for P_b, then

$$P_b = \frac{P_a Y + SRP_x}{SR + 1} \quad (7)$$

R for the apparatus is known, the first dead weight reading obtains P_a, and P_x is fixed since it has been stated that a 28 inch vacuum is desirable. Y may be estimated for the pressure P_a when the characteristics of the gas are suspected, a considerable error in its estimation having only slight affect. This leaves but S unknown and by trial the correct value of P_b for each withdrawal may be predetermined.

An example of an application of this method is shown in Figure (4) where the approximate burette pressure, in inches of mercury gauge, may be read directly. The graph applies to the volume ratio of the apparatus described. In its construction, equation (7) has been modified to the following:



New Service Building of Boston Consolidated Gas Company. Left—Side facing Railroad Tracks; Loading Platform is on Second Floor Level. Right—Main Entrance

New Service Station of Boston Consolidated Gas Company

Plant for handling distribution routine and similar activities embodies the latest design and apparatus for carrying out the work with dispatch

HENRY M. RILEY
Editor, American Gas Journal

ABOUT the first consideration incident to the erection of a building of any sort is the selection of the site; in the case of as comprehensive a unit as the Boston Consolidated Gas Company's new service station, such a choice was worked out and decided upon with mathematical accuracy.

Seven vital factors—complaints, growth in population, laying of mains, appliance installations, leaks, househeating installations and applications—were each weighed for their particular centers of gravity and the center of these seven points was calculated. Peculiarly, the ultimate center came in the middle of Jamaica Pond! Hence, a site was chosen about three quarters of a mile from this point, the land being already owned by the Company and located next to a railroad spur. Obviously, Boston Consolidated Gas Company can well plan on a minimum operating cost for work going out of this station for many years to come.

Varied Activities

The plant, which will be in full operation about April first, will handle the following work and routine:

Repair of Meters
Repair of Ranges, etc.
Carpenter Shop
Welding Department
Storage of Pipe and Lumber
Housing and Repair of Street Dept. Equipment
Garage and Auto Repair
Appliance Testing Laboratory
Clerical Department for Distribution Work
Drafting Room
Appliance Installation Department
Leak and Complaint Department
Mains and Service Department
Blacksmith Shop
School Room for Fitters
Plant Construction
Display and Advertising

Naturally, the physical structure for housing all of these varied activities for a company the size of Boston Consolidated calls for a large and comprehensive layout. Hence, we find three units in the building group proper: a one story shop measuring 140 by 50 feet, a main building of five floors and basement 200 by 100 feet, and a garage of two stories 200 by 80 feet. As to personnel, some 650 men work out of the station.

In the description of this station we have selected the meter repair shop to start with, feeling that perhaps

this is the most important unit in the general run of distribution plants. This department is located on the top or fifth floor of the main building and normally will employ 27 meter repair men who will handle approximately 34,000 meters per year. The handling of the meters from incoming auto truck to the fifth floor includes the backing of the trucks up to an unloading platform in close proximity to a special elevator which is used exclusively for meters.

Much thought has been given to the comfort of the men in the meter shop; thus we find benches with individual ventilating hoods connected to a central exhaust fan. Further, under each hood is located an indirect lighting hook-up. Modern appointed locker rooms and showers are provided. On one side of the shower room is located a locker room for the men's working clothes and on the opposite side a locker room for street clothes. Thus, the men can pass through the showers and there is no contact directly from soiled to clean attire. There are two sets of showers, 12 each for men and women.

Some of the equipment and procedure in this department are as follows: There are fourteen provers, ranging in size from 5 to 20 cubic feet capacity; hot caustic solution is used for cleaning the meters; meter painting is accomplished by means of spray apparatus; the meter shop store room will carry a three months' supply of all parts and diaphragms sufficient for nine months' needs will be stocked; all testing will be done by air and two tanks for testing for leaks will operate at 2 lbs. pressure.

A Fine Cafeteria

The fourth floor of the main building will probably hold considerable interest for the employees, since it is the location of an excellent cafeteria. Here will be found an up-to-date kitchen with the most modern gas ranges and other incidental equipment. The ranges and other kitchen equipment alone cost $12,000. In the cafeteria, which will serve tempting and substantial food at practically cost on monogrammed dishes, are forty-two tables, each to seat four. Knowing the propensity of the average individual to rearing back in a chair, the Company has installed 168 specially reinforced chairs; accordingly, shortly following the first gustatory sigh after a hearty repast, the men can rock back in their chairs and swap yarns with abandon. It is of interest to note that, while this cafeteria and the rest of the plant is lighted by electricity, the Boston Edison Company employs gas ranges in its service station equipment.

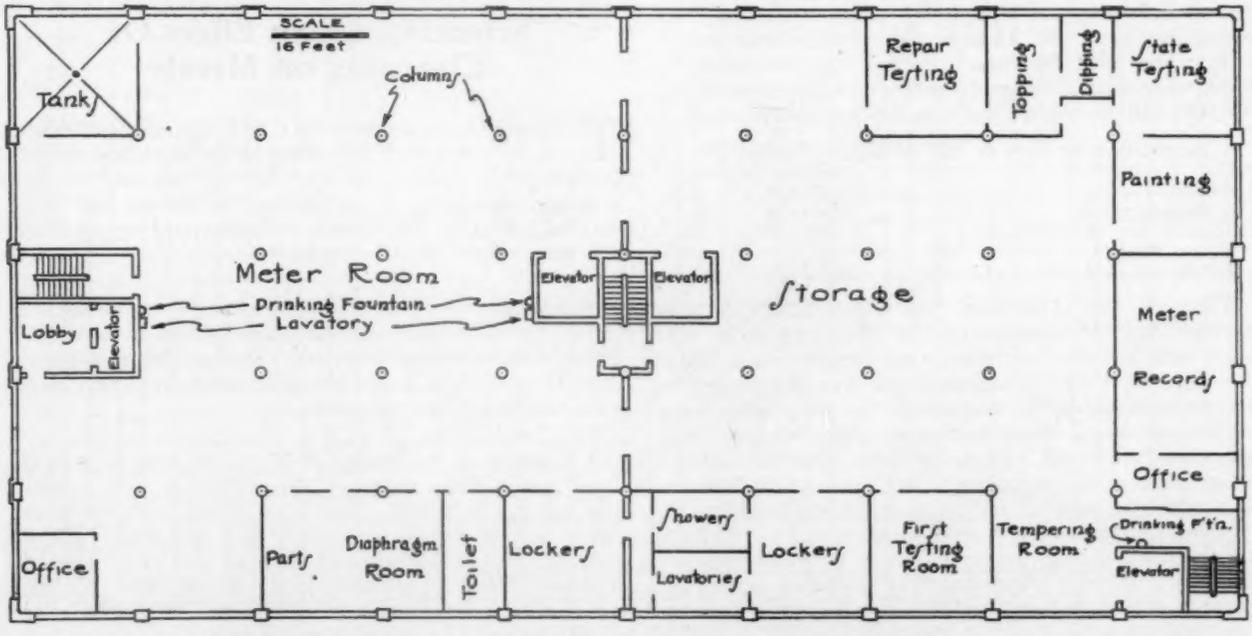
Also located on this floor, are the drafting rooms for the Distribution Department and the Construction Division; in the former are fourteen draftsmen and in the latter three. As necessary adjuncts to this drafting room work, there are a blue print room and a photostat room in close proximity. The central office for the district is on the fourth floor. When eventually centralized, this office will cover main and service laying and street work for practically all the low pressure area. Individual offices for key men, women's rest room, instrument room, and toilets and showers also occupy a portion of this floor.

On the third floor of the main building a well equipped testing laboratory, approximately forty feet square, will handle the testing of ranges, water heaters, househeating furnaces and other appliances. Three men will constitute the laboratory personnel. The appliance school adjoins the testing laboratory and is also about forty feet square.

Customers' Service Department

One very important phase of gas company activity, special service, has its quarters on this floor. Thus we find the room for the leak men, the dispatcher's quarters and the switchboard room conveniently grouped. The dispatcher routes ten trucks throughout the course of the day, the trucks each being manned by one driver and one service man. Part of the customers' service department consists of the force for connecting appliances and has a roster of 57 men. Individual offices, locker room and storage quarters are also located on the third floor.

The second floor of the main or service building is essentially given over to storage, while the first floor contains the first aid room, machine shop, refinishing room, and meter and miscellaneous storage quarters. On the east side of the building and on the first floor



Fifth Floor, Service Building, Boston Consolidated Gas Company: Numerous windows are located on the four sides

level is the loading platform which is approximately 200 feet long and 12 feet wide.

As previously noted, the garage has two floors with a ramp to the second and an elevator for "cripples." The first floor, aside from the space occupied by the elevators and stair well, is clear. The second floor contains the auto repair shop, tool room, shower, lavatory and locker room and storage space. The repair shop measures approximately sixty feet by sixty-eight feet. The toilet room adjoins the showers and lockers but is separated by a partition from the latter.

The shop, one story in height, houses the display and advertising room, 19 by 49 feet, blacksmith shop, 38 by 49 feet, paint shop, 38 by 49 feet, and the carpenter shop, 38 by 49 feet. The shop building has an average clear head room of about 15 feet.

Gas Heated Throughout

Some interesting incidental features of this new service station are as follows: The station is heated by gas; the basement and the first and second floors of the service building, and both floors of the garage are heated by the Lee warm air gas fired system. This unit burns about 12,000 cubic feet per hour and the warm air is forced through the ducts by a circulating fan driven by a 20 horsepower motor. The three upper floors of the service building and the shop building are heated by the Dunham steam differential system which includes a Bryant gas furnace. Unit heaters are used except in the clerical offices.

The storerooms have all-metal shelving and there is a separate modern storeroom for auto parts. The storerooms proper contain 9800 compartments. Complete oxyacetylene welding equipment of the Linde make is provided. For unloading pipe there is a five-ton wall jib crane attached to the side of the building and a space of two acres has been set aside for the storage of pipe.

The street department machinery, consisting of two diggers, two backfillers, one tamper backfiller, one sweeper, one crane, three 220 compressors, three 110 compressors, and three spares have assigned space in the garage.

The structure is of fireproof construction and is built of concrete and brick. It is of interest to note that the brick used were fired in gas kilns. A sprinkler system is installed throughout.

An inspection of this plant at once impresses one with its facilities for handling the various activities at a minimum expense. Further, much thought has been given to comfortable working conditions for the employees. As an evidence of saving effected in operating costs it is well to mention that, under the former set-up, eight men and three trucks occupied a full day in unloading, transporting and storing a car of appliances, whereas at the new station, three men perform the same task in one hour and fifty-five minutes.

The plant is just about the last word in distribution station design and its inspection and study would be well worth while on the part of any gas man.

Marketed Production of Liquefied Petroleum Gases Increases 58 Per Cent During 1931

AN increase of nearly 10,500,000 gallons, representing a gain over 1930 sales of 58 per cent, brought the 1931 marketed production of liquefied petroleum gases to a total of 28,502,819 gallons, according to the United States Bureau of Mines, Department of Commerce, following the completion of a survey of 1931 operations by E. B. Swanson, chief petroleum economist. The 1931 increase exceeded that recorded for 1930, when marketed production was approximately 8,000,000 gallons higher than in the preceding year.

SEGREGATION BY USES OF 1931 MARKETED PRODUCTION

Use	*Gallons*	*Per Cent*
Domestic	15,294,648	53.7
Gas Manufacturing	6,184,655	21.7
Industrial and Miscellaneous	7,023,516	24.6
Total	28,502,819	100.0

Through the American Gas Association, it was learned that 118 communities in 28 States were supplied with liquefied petroleum gas by 59 companies at the close of 1931. Undiluted gas was distributed in 24 communities by 7 companies, the remainder being butane-air plants. One butane-air plant was reported operating in Canada. In comparison with installations in operation at the beginning of the year, when 59 plants were reported, an even 100 per cent growth is indicated.

Several companies reported an extension of marketing territory during the year. New developments reported include the employment of liquefied petroleum gases in cotton singeing and the use of liquefied petroleum gas as a fuel and refrigerant for motor trucks designed for the transport of perishable commodities.

Four companies began producing and marketing liquefied petroleum gases during 1931, bringing the total number to fourteen, one company previously producing having reported no 1931 production. A list of these producers may be obtained by writing the Petroleum Economics Division, U. S. Bureau of Mines, Washington, D. C.

Scientists Learn Effect Of Cleansing on Metals

THE effect of disinfectants and cleaning materials on metals, which is coming to be important to the housewife as well as to the engineer because of the growing popularity of metals for the home, has been carefully studied by German scientists and reported in the publication Metallwirtschaft.

Sheet samples of 40 different metals were immersed for 24 to 48 hours at certain temperatures in 24 disinfectants and cleaning solutions. The samples were carefully cleaned, loss in weight was determined and they were examined microscopically.

According to the magazine's report, iron and steel were attacked by most of the solutions, and copper was not much better. Zinc was found to resist their action poorly, while aluminum and aluminum alloys were attacked by all acid and alkaline solutions. Tinned steel and tinned copper were fairly satisfactory. Nickel, nickel alloys, stainless steel and chromium-plated steel were best.—*White Metal News Letter.*

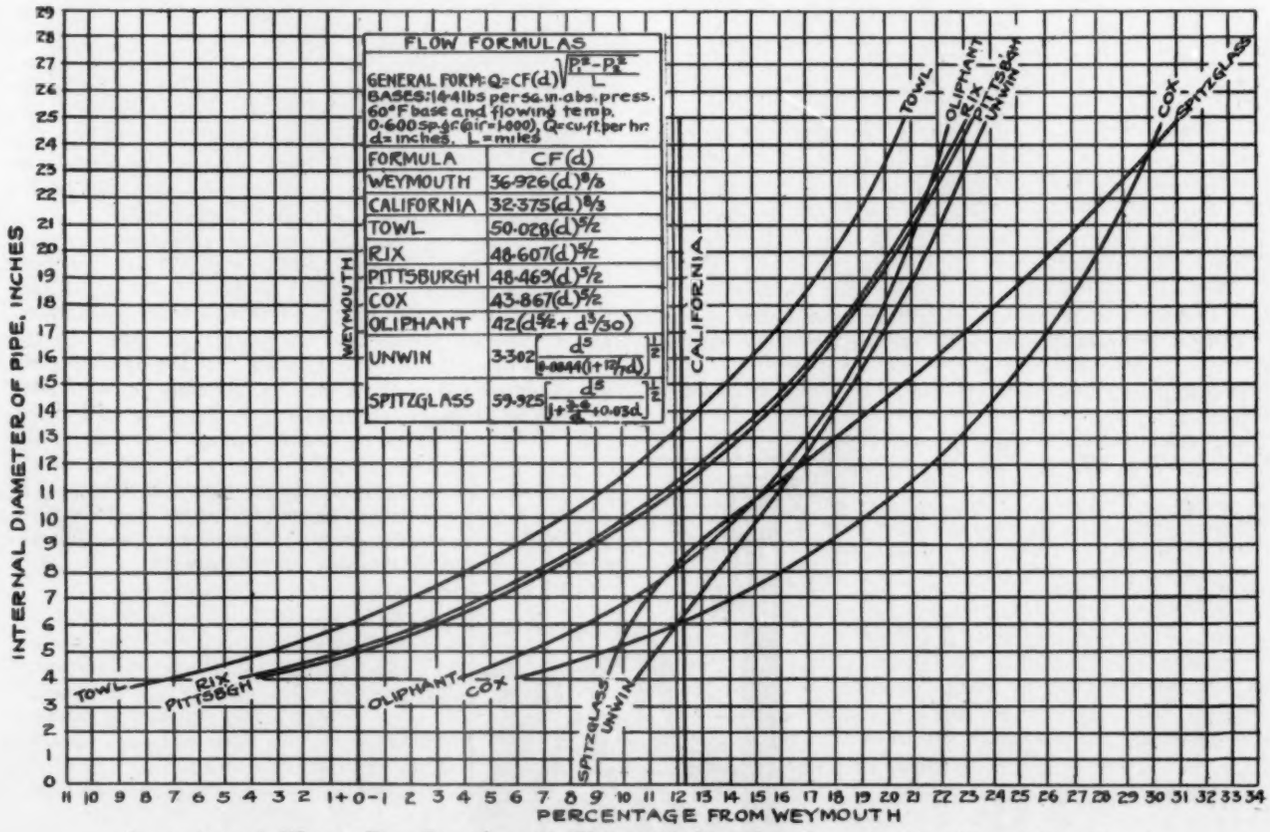
Important Study of Flow of Natural Gas Through High-Pressure Transmission Lines

THE United States Bureau of Mines has recently issued Report of Investigations 3153, "Factors Influencing Flow of Natural Gas Through High-Pressure Transmission Lines," which presents the results of work done under a cooperative agreement between the U. S. Bureau of Mines and the Natural Gas Department of American Gas Association. Excerpts from this paper, which was prepared by W. B. Berwald, Associate Petroleum Engineer, and T. W. Johnson, Associate Natural Gas Engineer, both of the U. S. Bureau of Mines, Petroleum Experiment Station, Bartlesville, Oklahoma, are given below.

The United States Bureau of Mines, in cooperation with the Natural Gas Department of the American Gas Association, has been studying actively for the past several years the problem of the flow of natural gas through high-pressure transmission lines. Numerous data on gas flow through pipe lines under many conditions of operation have been obtained by carefully conducted tests, and these data, together with all other available information, have been analyzed carefully to secure practical facts for the use of operators in designing pipe lines and determining the effects of different operating conditions on pipe-line capacities.

The first procedure in initiating this problem was to review, compile, and analyze all of the existing data on the flow of natural gas through pipe lines. Actual data applicable to pipe and operating conditions normally used in the transmission of natural gas were meager, and the several pipe line flow formulas developed by different investigators gave widely varying results when applied to problems of pipe-line design. Therefore, further experimental work under conditions comparable to those found in transmitting natural gas was essential before any definite recommendations could be made.

The problem, as originally planned, included flow tests on pipe lines in operation, and in each test the measured delivery was to be compared with the delivery



Comparison of different Flow Formulas with Weymouth's Formula in Percentage for different Pipe Diameters.

calculated from several common pipe line flow formulas. Flow tests have been made on 29 different pipe lines, totaling 757 miles of pipe, and located in the principal natural-gas areas of the country. The diameters of the pipe lines tested range from 6 to 22 inches and the operating pressures from 30 to 600 pounds. A careful study and analysis has been made of all factors affecting the flow through each line.

Fundamental data on some of the variable factors influencing the flow of gas were obtained from tests with a small experimental pipe line, where precision of measurement and close regulation of variables was possible. The results of these tests show a small variation in the coefficient of friction with density and velocity, and indicate a relationship between the coefficient of friction and some function of the diameter, velocity, density, and viscosity of the gas.

The nature of the investigation was primarily an engineering study of pipe lines used in the long-distance transmission of natural gas and a comparison of the actual observed rates of flow with the results obtained from the application of the various pipe line flow formulas.

Scope of Report

This report is intended to be a brief and abstract account of the work and results of the pipe line flow investigation, suitable for the use of the operator in designing pipe lines, and analyzing the effect of different operating conditions on the efficiencies of pipe lines in delivering gas. All of the important facts connected with the investigation are emphasized without accompanying detailed and involved discussions. A detailed discussion and description of methods and apparatus used in the tests, together with other discussions that were available at the time, have been given in a previous publication.* The important factors discussed in this previous publication are again emphasized to make this report as complete as possible. The report includes a comparison and discussion of the common pipe line flow formulas, the factors which determined the selection of pipe lines for study, the method of conducting the field tests, comparisons between the measured deliveries and those calculated from the pipe line flow formulas, and a discussion of representative tests and results. The importance of maintaining the pipe line free from condensates, rust scale, or similar obstructions is emphasized with results from tests under such conditions.

The work of several investigators on the flow of fluids and on the relationship between the coefficient of friction and the ratio $\frac{DUS}{Z}$, where D is the diameter, U the velocity, S the density, and Z the viscosity of the gas, also is discussed.

The coefficients of friction obtained from the tests conducted by the authors on both the commercial and experimental pipe lines are compared to the corresponding values of $\frac{DUS}{Z}$.

Summary

A large number of formulas for the determination of pipe-line capacities exist, but they give widely different results for like values of the factors influencing the rate of flow.

The results of the experimental tests made in this investigation, show that Weymouth's pipe-line flow formula, when applied to the larger-diameter lines free from condensates and other foreign material and operating under steady flow conditions favorable to accurate measurement, will give a volume within a few per cent of the measured delivery.

Further analysis of the data from the flow tests on commercial lines, together with the results of laboratory investigations and tests on a small experimental pipe line, indicates that there are small variations in the coefficient of friction, dependent upon the velocity, density, and other physical and chemical properties of the gas, that are not included in any one of the common formulas. To account for the effect of those variables on the coefficient of friction would result in a more complicated formula, and its application to design and operating problems would be greatly hindered.

Sufficient data are not available to establish the relationship between the coefficient of friction and these variables through the range found in commercial practice. The tests on the small-diameter experimental lines indicate the nature of the relationship; however, it would be necessary to determine the absolute values for all common sizes of pipe, varying the velocity and density of the gas and using several different natural gases and pipes of different roughness. More precise analyses of flows through individual lines may be made by means of the relation between the coefficient of friction and the Reynolds criterion. This relation is affected by factors peculiar to individual lines and for this reason no average relation could be recommended to apply over a wide range of pipe lines and flow conditions.

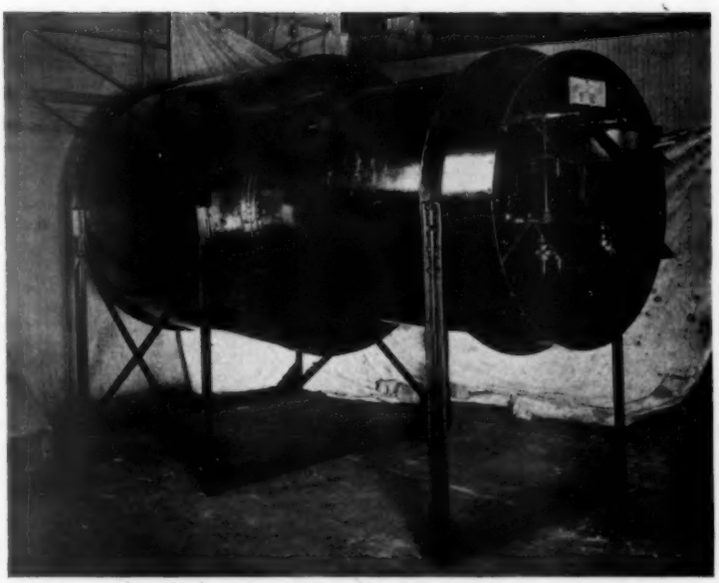
The value of applying many small corrections to pipe-line flows, such as small differences in elevation between the inlet and outlet of the line, reduced diameter fittings, the effect of bends, right-angle turns, metering stations, drips, type of joints, and the length of pipe between joints is often greatly diminished because of conditions affecting individual lines such as unsteady rates of flow, storage or drainage taking place, the presence of condensates, rust and foreign material in the line, and the relative roughness of the interior walls of different lines. The effect of these conditions is often many times greater than the sum of all the measurable corrections.

**Johnson, T. W., and Berwald, W. B., Flow of Natural Gas Through High-Pressure Transmission Lines: Rep. of Investigations 2942, Bureau of Mines, 1929, 18 pp.*

Gas-Fired Rotary Dryers

A varied line of products are efficiently dehydrated by gas on the Pacific coast

J. LYLE VANCE



Leahy Mfg. Co. Dutch Oven Housing—Burners detached from Rotary Dryer.

Interior of Leahy Mfg. Co. Dutch Oven showing Gas Burners and Refractory Lining.

SINCE these are times when by-products, scraps and waste take positions of first importance in the industrial scale, engineers and chemists are working night and day and bending every effort to recover dollars from scrap piles and junk.

Dehydration is often one of the major processes in these recovery operations, and here in Southern California the manufacturers of gas burners and equipment, as well as industrial gas engineers of the utilities are often called in to help developers over the rough spots. A trip with the representatives of the Leahy Manufacturing Co., one of these burner manufacturers and the Standard Boiler & Steel Works, manufacturers of rotary kiln type dryers to a number of large scale dehydration plants proved very enlightening.

The first place visited was a plant at the Los Angeles Harbor where seaweed is made into stock feed. The seaweed beds in which the cutting is done are well off the coast where the water is free from pollution. It is harvested by means of a marine mowing machine, brought to the plant in huge scows, unloaded and run through chopping machines. From the chopping machines the seaweed is fed into a large revolving Standard Boiler Works dryer, heated with natural gas burners through Leahy multi-jet gas burners in a setting especially designed for this particular application. This revolving dryer, cylindrical in shape, is elevated at the end into which the chopped seaweed is fed and it is at this end that the heat is applied. The drying seaweed works down toward the lower end, tumbling over and over.

The Leahy multi-jet burners, thirty-six in number, nest into a cross shaped "Dutch Oven" set up against the receiving end of the revolving dryer. This oven is lined with refractory brick and the surrounding shells are so arranged that the air for combustion is preheated.

At the discharge end of the dryer there is a large multivane type suction blower drawing great quantities of air and the hot gases through the dryer. Since it would be fatal to the successful operation of the burners to attempt to draw all necessary air for drying through or immediately around the burners, provision is made by the dryer manufacturers for taking this air between the burner chamber and the dryer. This air too is drawn first between shells surrounding the oven, so as to preheat it and utilize heat which would ordinarily be lost through radiation.

By properly balancing the dampers at the openings, admitting air to the burners and directly into the dryer, the proper draft condition at the burner can be created and the required amount of air to reduce the temperature of the combustion gases to the point which will not injure the product can be secured. At the same time the air will have moisture carrying capacity sufficient to remove the water from the seaweed.

At the discharge end of the dryer the dried product drops to a conveyor, is carried to the grinding mill and the air from the suction blower passed through eliminators, recovering all the dried seaweed which is drawn

through in the form of dust. It is claimed for the resultant product that it is superior as a stock feed owing to its high vitamin content, excelling in this point by several times any similar product dried in the sun.

A trip to nearby fish canneries disclosed an exactly similar installation used to dehydrate inferior quality fish and the scraps and trimmings from the canning operations. The meal produced here was to be used as poultry and hog feed as well as fertilizer.

At an orange juice plant in Los Angeles the orange pulp and peel are dehydrated and made into stock feed. It is interesting to note that orange refuse has always proved very difficult to dehydrate. Various methods have been tried and very considerable sums of money spent in trying to successfully accomplish this. It was only when this type of dryer was installed that the process was wholly successful.

The product turned out by the manufacturers of orange drinks retains its golden color, keeps perfectly and is a source of revenue where once it was a bulky waste material, the disposal of which was very expensive.

These wet products are dehydrated with an average of 1,837,500 B.t.u. per wet ton of product handled.

Experience has shown these dryers to be eminently successful in preparing a wide range of substances for the market. Included in the long list of applications in which they have been used are bark, beet pulp, blood, bone and packing house tankage, carbon sludge, cotton seed, grain, gravel and sand, lime, ores, sugar refuse, tobacco stems, wood chips and many others.

Treating Sardines

A variation of this process was seen at one of the fish canneries where sardines are prepared. One of the processes consists of placing the cleaned sardines in shallow wire trays, putting these upon a traveling conveyor and carrying them through a drying chamber which is box-shaped. This chamber is short and high, the trays starting in at the top and passing forward and back several times, but working downward all the while to the discharge. The same type of gas furnace is used to supply the heat for this dryer as previously described and air is sucked through by a large blower at the end opposite the furnace.

Automatic temperature control is a vital part of this installation since the product treated is for human consumption and exact temperatures are imperative to the quality of the food.

Showing to what extent waste is conserved in this fish canning industry, there is a concern which takes all sewage from the several canneries even to the water used in washing the floors, machinery, and utensils, and conducts it to a plant where it flows into huge vats. In these vats are steam coils which evaporate the water from the solids to produce fertilizer. The boilers supplying the steam are gas-fired.

An interesting variation of the dehydrators for seaweed, fish scraps, orange pulp and sewage was found in a plant where a special clay is prepared for filtering purposes. Any by-products of combustion affect this clay chemically and must be excluded. To overcome this, there is built into the revolving cylinder a large tube leading the gases from the oven to the opposite end; there this tube discharges its hot gases into smaller tubes which conduct them back again to the furnace end where they are vented. The clay tumbles over and around this large tube and the small tubes and its moisture is carried away in the air drawn through as previously described.

The rotary type of dryer has here displaced practically all other methods for rough products such as those cited and seems to be the best yet devised. The managers of the various plants were unanimous in endorsing it and in much preferring gas to oil or other fuels.

They pointed out particularly that not only does gas in no way affect the product so as to injure its palatability to stock fed upon it, but also that they had never experienced the difficulty attendant with other fuels in the way of burner troubles or scorching. The labor saving and safety features of gas were also highly appreciated in every case. They stated in fact that unless the cost difference was highly prohibitive they would not care to use any other fuel.

Substantial Increase in Gas Househeating

A FIFTY per cent increase in the number of homes using gas for heating was noted in 1931 in the territory served by the Consolidated Gas Company of New York and its affiliated gas companies. On December 31, 1931, there was a total of 3,122 gas-heated homes on the lines, as compared with 2,080 on December 31, 1930.

The largest percentage of increase in gas heating installations occurred in the territories served by the New York and Queens Gas Company, on Long Island, and by the Bronx Gas & Electric Company, in the Bronx. Each of these sections reported increases of approximately one hundred per cent.

The person most interested in automatic home heating is the man of moderate means who is forced to undertake personally the job of tending furnaces, rather than the man who can afford to hire help, according to the experience gained in installing gas heating systems during the past year.

With the increase in the number of homes employing gas heat, there has been a definite reduction in the average size of the houses so equipped, according to Oscar H. Fogg, Vice-president of the Consolidated Gas Company. It is apparent that the small six and seven room house owned by people in moderate circumstances is following the more luxurious residence in adopting automatic heating methods.

On January 1, 1931, in the territory served by the Consolidated Gas Company and its affiliated gas companies, the average house using gas for heating contained 530 square feet of radiation. On January 1, 1932, this figure had dropped to 448 square feet, due to the installation of gas heat in homes of the smaller type. The same trend was apparent in the territory served by the Westchester Lighting Company, where the figure of 536 square feet of radiation on January 1, 1931, dropped to 515 square feet on January 1, 1932.

Outstanding developments during 1931 included the general adoption of automatic gas heat by three large real estate developments in the Flushing, Long Island, district. A total of twelve hundred homes will be involved when the developments are completed.

An important factor in the stimulation of house heating by gas has been the special reduced rate, now in effect for this class of business.

Does Present Economy Threaten Future Profits?

Major management problems present in planning, research, advertising, and sales effort in bad-business periods

R. S. McBRIDE

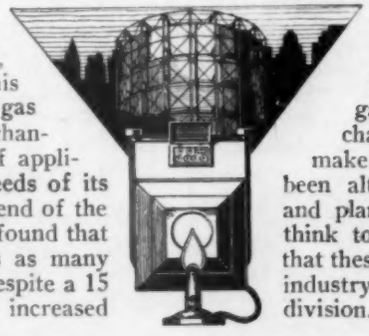
Consulting Editor, American Gas Journal

PROFITS have continued to flow from the operations of most gas companies. In this respect the industry has been far more fortunate than most others. However, much of the benefit to the public and to the industry which should have flowed from this happy situation has been lost for two reasons: In the first place the plight of exploited holding companies so conspicuous through Wall Street manipulation has overshadowed the very real success of what constitutes the industry proper. In the second place many of our managements, either directly or under orders from "headquarters," have fallen seriously ill of the melancholia now rampant in all business, even though they should have been immune.

A secondary consequence threatens to prevent the proper development of the markets for public utility gas. This threat lies in the drying up of the sources of new and improved utilization equipment and in the destruction of the proper merchandising efforts of the utility companies themselves. No more serious obstacle to continued profits could be erected by the industry than these.

EFFECTIVE sales effort is more essential to the development of gas today than ever before. Competitive fuels were never cheaper nor efforts to sell them more vigorous. Gas must therefore be most aggressively pushed in every potential market if it is even to maintain its present position. Merely standing still on our present achievements will cause us actually to lose ground relative to other energy supplies.

A few outstanding examples of successful merchandising by gas companies conclusively show that such effort is not futile even at a time when public buying is at a low level. One local management, for example, refused to admit that this was a poor year for gas. It cut its gas rates, multiplied several fold its merchandising effort, added a fine new line of appliances more completely fitted to the needs of its community, and it got results. At the end of the first full calendar year of this effort it found that it had sold approximately four times as many appliances as in any previous year. Despite a 15 per cent cut in its rates it had so increased sales that the profits for stockholders were nearly 20 per cent greater than in any preceding period. And best of all it had achieved an enviable position of good will with its local public that assures still further advantage from a proposed second substantial cut in gas rates now under consideration. Not every local enterprise could be so successful as this, because not every one has been so neglectful of its full opportunities in previous years. There is, however, ample opportunity in almost every community for enlargement of merchandising activities with real profit both early and future.



A VERY LARGE number of operating companies have found themselves in a situation strikingly in contrast with the one just described. Salary cuts on sales forces and curtailment in number of persons on the merchandising staff have been accomplished under the excuse of "hard times." One enterprise following such a policy did so despite the fact that in every single month of the year preceding its wage and personnel cuts it had made more money than in the preceding year. Apparently this grossly unjustified restriction of merchandising activity was ordered by some absentee manager who was trying to appease a promotion banker in Wall Street into whose clutches he had fallen during the speculative era preceding. Certainly no local manager with any vestige of good sense would have been guilty of such a fallacious policy. The consequences of that policy were, as was to be expected, a slowing down of sales effort and discouragement of staff, and a small decline in the total business of the company.

In the long run, however, it is not the individual sales groups or individual profits of local companies that are most seriously affected by all this situation. The almost fatal consequence, if one looks to the future, lies in the wreckage of the gas appliance manufacturing and merchandising groups. The companies which make up this division of the industry have been altogether neglected in the consideration and planning of many companies. One would think to hear the remarks by certain gas men that these appliance companies were leeches on the industry, not just as vital a part as is any other division. As a matter of fact the appliance and

equipment builders have probably done more for the real advancement of the industry in the past decade than any like number of individuals holding responsible managerial positions in operating concerns. They have certainly contributed more new ideas, more constructive thought, and more lasting benefit than has been credited to them. Much commendation is accordingly due them.

Kinds of Fuel and Power Purchased
Quantity and Cost to all U. S. Manufacturing Industry
(*U. S. Census of Manufactures, 1929*)

Anthracite Coal (long tons)	9,280,000	$43,540,000
Bituminous (short tons)	214,020,000	754,500,000
Coke (short tons)	52,390,000	243,640,000
Fuel Oils (gallons)	6,583,190,000	212,630,000
Gasoline and Kerosene (gallons)	48,470,000	7,550,000
Natural Gas (M cubic feet)	429,820,000	86,360,000
Manufactured Gas (M cubic feet)	1,258,450,000	127,570,000
Other Fuels		22,390,000
Purchased Electric Energy (kilowatt-hours)	37,393,830,000	475,630,000
		$1,973,860,000

IF ONE goes over the list of new gas-making, gas-distributing, and gas-burning equipment which has been developed within the past decade, it is indeed a rarity to find any of it which has really originated and matured to workable commercial scale outside of the concerns whose business it is to build and merchandise such equipment. Perhaps in no other great process industry has so little of the development work come from operating staffs of the manufacturing companies and so much from equipment builders. The reason for this is, of course, obvious. It has not been the custom, or "fashion" let us say, for gas companies to spend any money of consequence on real research or development of this character. They have been willing to test out the proposals of equipment companies, but they have not as a general thing had proposals of their own on which they were willing to spend money.

Perhaps some readers of AMERICAN GAS JOURNAL will be disposed to question this rather sweeping generalization. As a matter of fact it is not applicable in every case, nor is almost any other generalization. But if tested carefully, it is believed that it will be found to be strictly true as a generalization with regard to the vast majority of improvements which have lowered the cost of gas making or facilitated the application of gas in industry or in the household. And if it be true, then some very important deductions should be drawn from it.

In the first place, the gas industry should make a more intensive study of what is really wanted in the modern home. Far too many comparisons between gas burning appliances have been made purely on a price basis. Sales managers have been overawed by the builders of small, cheap, speculative houses or apartments. Because they failed to get certain gas stove or water heater contracts on such jobs, they have run panic stricken back to their headquarters and demanded "something that we can sell cheaper." As a consequence such managers have been accommodated by equipment builders with "a stove to sell for thirty-nine fifty." They got a stove that was worth all of this, perhaps a little bit more; but they destroyed the opportunity to make worth while equipment sales in the better homes where families of moderate to comfortable income struggle with inadequate appliances that do their work only fairly.

In the better homes, and they are the places which really use the bulk of the household gas, an extra ten dollars would gladly be expended for a quality appliance with proper insulation, proper corrosion resisting parts, and proper design for good appearance. But the gas man has assumed that the housewife or her husband wants something moderately priced when they present themselves at the appliance store. They are not encouraged to look at the service value of the appliance until after it is emphasized that the price tag is much less than that for an electric stove. Thus the salesman by the type of appliance which he is forced to demonstrate, makes himself appear cheap in the eyes of his customer from the very start. Only a few of our wiser merchandise managers in the gas industry have completely escaped this widespread fault of the industry. And none of the appliance manufacturers have wholly escaped it, for every one of these builders has found so many who demand cheap equipment that he has been unable to spend funds as generously as he would like to do on the development of better designs, more convenient equipment, better insulated or more durable parts, or on research for altogether new types. The economy warp of his customers makes the appliance builder miserly in his own research. He cannot escape this difficulty until the gas companies themselves change their point of view.

THE AMERICAN HOUSEHOLD is likely to be reorganized within the next decade in many respects. The changes will not all be social and economic. Many of them will relate to such fundamental matters as mere housing and housing facilities. It was in recognition of this latter prospect that so many outstanding men were willing to give their time to the housing conference called recently by President Hoover.

Gas Consumption and Cost, by Industries for the United States
(*U. S. Census of Manufactures, 1929*)

Industry Groups	Natural Gas		Manufactured Gas	
	M cubic feet	Cost (dollars)	M cubic feet	Cost (dollars)
All industries, total	**429,826,799**	**86,369,465**	**1,258,450,089**	**127,571,426**
1. Food and kindred products	34,752,338	8,666,105	8,572,968	6,610,633
2. Textiles and their products	1,750,325	364,202	1,703,774	1,536,455
3. Forest products	2,492,916	522,400	493,761	306,870
4. Paper and allied products	12,411,249	1,092,428	164,323	95,265
5. Printing, publishing, and allied industries	1,705,525	711,855	2,055,372	1,794,527
6. Chemicals and allied products	11,973,198	2,318,331	1,472,869	1,090,956
7. Products of petroleum and coal	129,902,410	17,545,308	298,213,785	54,842,325
8. Rubber products	1,296,559	167,059	32,152	32,585
9. Leather and its manufactures	95,579	38,363	133,044	128,957
10. Stone, clay, and glass products	121,038,585	24,452,853	2,900,370	1,913,389
11. Iron and steel and their products, not including machinery	68,298,915	20,013,680	925,688,163	47,708,452
12. Nonferrous metals and their products	24,609,575	4,099,339	3,022,557	2,185,774
13. Machinery, not including transportation equipment	9,004,736	3,797,719	8,103,422	5,275,651
14. Transportation equipment, air, land, and water	3,316,274	1,135,248	4,503,938	2,837,818
15. Railroad repair shops	6,345,839	1,093,058	137,965	118,913
16. Miscellaneous industries	832,776	351,517	1,251,626	1,092,856

At the Housing Conference there were several efforts made to develop fundamental information on the requirements for mechanical facilities needed in the modern home. As might be expected great stress was laid on the development of electrical facilities. No corresponding effort was made to demonstrate the adequacy and the material advantage for many purposes of gas. Practically the only contribution which supported the idea that gas had an important

function in the modern home was one made by a Government scientist. The industry itself was not on the job. There was nothing presented to tell of the advantages of gas water heating, gas house heating, gas for cooking, or the potential service in numerous other ways in the completely modern home. Here was a case where foundations were being laid for the potential development of millions of new homes. One might think that the gas man did not care whether he even connected a service pipe to them. Such situations should not be allowed to exist. They are not in keeping with the attitude of the leaders of the gas industry.

And in the marketing of industrial gas an even more fatal mistake has been made. The industry has undertaken to sell heat or heating appliances rather than heat application. The gas man has forgotten that when a loaf of bread or piece of steel or other "work" to be heated is placed in the oven this inert matter does not pause to notice enroute whether it be wire, pipe, or coal shovel that is bringing the energy to the heating appliance. But that inert matter, once in the oven or furnace, does very promptly take account of whether the temperature be right, the temperature distribution satisfactory, and the processing condition ideal. If so, the raw material responds by producing a satisfactory product, regardless of the energy medium used. If the heating conditions be bad, it is immaterial what the cause, the product will not be all that is desired.

WE HAVE HEARD a great deal at conventions and "pep meetings" about "selling service" to our industrial consumers. That is the proper ideal of the industry. If we can render a heating service which is over all superior, we are likely to get the business. The real test, however, is the texture of the biscuit or the temper of the steel, not the size of the gas bill.

Electrical equipment people have played up this feature and have almost convinced industry that if they do it electrically they are doing it in "the modern way." The gas man at his conventions talks most convincingly of "Do it better with gas"; but he seldom really sells this idea back home. As a consequence we repeatedly see a type of thing which appeared recently in one of the outstanding business magazines, saying that "The new electric roaster conserves flavor, permits closer control." It is quite likely that the new roaster referred to did do both these things; but it might have done them just as well with gas for heat as with electricity. It did not do so with gas, largely because nobody had spent the money necessary for the research which precedes the completing of such a thoroughly satisfactory gas-heated roaster to accomplish these important objectives.

GAS-APPLIANCE builders of the United States recognize their opportunities and would welcome an opportunity to work with the rest of the industry for mutual advancement. Neither group can advance without the other. Cooperation would, therefore, seem to be indicated; but just at this crucial time there comes the proposal that the appliance and equipment companies will not hold their customary exposition at Atlantic City for the annual convention of A. G. A. This is an alarming symptom of a serious disease which has gone without adequate treatment in the body of the industry far too long. It is an ailment which unquestionably will be long and lingering with untoward consequences to every part of the body unless vigorous corrective measures are taken. No palliatives will suffice. A major operation is necessary.

Under these circumstances it is not very difficult to make a general diagnosis at least of the type of ailment. It is not so easy, however, to prescribe a remedy or to select the chief surgeon who is to operate on the diseased member. The difficulty, however, does not justify inaction. A council of the ablest should be called and more accurate diagnosis than now is available should be reached. Then the staff to care for the patient should be appointed *and supported* both with the ablest of talent and the assurance of generous financial backing.

In the accompanying tables are shown clear evidence of the magnitude of the job of surveying American industrial energy. Approximately 10 per cent of industry's energy bill is paid for gas. There is every reason to believe that from 25 to 30 per cent could advantageously be for gaseous fuel, including that bulk gas supply which should soon become a part of the utility industry's most profitable fields. This larger figure assumes no extravagant new development of industrial gas supply that does not appear entirely probable of realization over a period of comparatively few years assuming a genuine interest and a willingness to invest on the part of the leaders of the industry.

IT IS EVIDENT that four definite steps should be taken by the gas industry. The taking of any one of these steps requires the spending of money. Executives will perhaps hold up their hands in horror at such a thought, but when one is ailing is no time to debate whether or not he can afford a few dollars to call on the physician or a few cents with which to buy needed medicine. It will be vastly better, if need be, to do without profits for a few months in order to insure a permanent flow of profits in the future. As a matter of fact so drastic a thing as suspending dividends is not likely to be necessary in the case of the majority of the gas business in order to put itself on a permanently sound merchandising basis. Its profits are substantial, even though some Wall Street manipulated securities may belie this generalization. Indeed they are adequate to permit generous investment in the future of the industry without creating any new stockholder hardships. Those concerns who cannot afford investment in the development of utilization equipment are the exception.

The four tasks which deserve immediate attention are the following:

1. *Gas Market Survey.*—This should be of three parts.

(a) A definition of the ideal modern gas-equipped home of each size class.

(b) A determination of the number of homes of each class prospectively to be equipped.

(c) A determination of the prospective market for gas in each of the major heat-using industries.

2. *Appliance Survey.*—A fundamental study, partially experimental, of the available and of the types of appliances to meet each major market need disclosed in the market survey. This study should relate to questions not alone of efficiency and durability, but also to marketability, style value, and probable customer response. The approach should of course be along wholly unconventional lines, disregarding the equipment habits of the industry since many of these habits will doubtless be found to be unwarranted. The result of this division of the work should be the affording of fundamental information to aid appliance builders as well as to aid gas companies in selection and selling of the equipment.

3. *Advertising.*—Development of a proper industry advertising campaign to present facts, not speculative

(Continued on page 42)

Apparatus for Determining Deviation from Boyle's Law

(Continued from page 23)

Let the subscripts s and e refer to conditions at the start and end of each individual cycle. The nomenclature will otherwise correspond to that previously given. Let Y_s and Y_e represent the deviation factors for air at P_{as} and P_{ae} respectively.

The volume within the bomb at B_a, and corrected for deviation, is at the start of a cycle equal to

$$\frac{V_a P_{as} Y_s}{B_a} \text{ and at the end, } \frac{V_a P_{ae} Y_e}{B_a} \quad (9)\ (10)$$

The difference between these two volumes,

$$\frac{V_a}{B_a}(P_{as}Y_s - P_{ae}Y_e) \quad (11)$$

should be equal to the gas metered in the burette during this cycle, which amounts to

$$\frac{V_b}{B_a}(P_b - P_x) \quad (12)$$

Equating (12) to (11) and solving for R,

$$R = \frac{V_b}{V_a} = \frac{P_{as}Y_s - P_{ae}Y_e}{P_b - P_x} \quad (13)$$

Equation (13) is applied to observations taken on the apparatus described in this paper to compute the volume ratio. From several individual ratios an average may be taken. It is unnecessary to adjust the metering pressure for the various cycles as the test need not be ended near atmospheric pressure. Should the several ratios systematically vary in one direction, the effect of water vapor or a leak might be suspected. On Figure (4) the deviation curves are given for dry air, free of CO_2, at three convenient calibration temperatures. Deviations are based on the factor being unity at a pressure of 14.73 lbs. per sq. in. Data were prepared from values given in the P.T.R. Warmetabellen, 1919, adapted for this use by Dr. E. Buckingham of the Bureau of Standards. A typical calibration tabulation is shown in Table (2).

Accuracy of Apparatus

If the procedure prescribed is observed, an inherent instrument accuracy of about ±0.0002 in the deviation factor may be guaranteed. As with the Bureau of Standards' apparatus the overall accuracy is mainly affected by observational errors. A specific problem has been chosen in order to clearly show the effect of the accumulated inherent apparatus' errors.

Suppose constants of an instrument to be: burette volume = 156 cu. in., bomb volume = 39 cu. in., volume ratio = 4, manometer capillary dia. = 3 m.m., area = 0.011 sq. in.

A natural gas, with a sample pressure suitable for constant atmospheric burette fillings, has a deviation factor of 1.1000 at P_s = 513.318 lbs. per sq. in. (10 cycles), and 1.0908 at 467.233 lbs. per sq. in. (9 cycles), according to formula (6). Evacuation is carried to 28 inches with a 30 inch barometer. A full cycle will be added by filling the burette at less than atmospheric pressure.

This obtains a condition of maximum apparatus error. Manometer readings for each cycle are the same. Each error will be separately investigated.

(a) Effect of deviation on residual burette gas—The gas remaining in the burette after partial evacuation is compressed from 2 to 30 inches Hg., or through 13.748 lbs. per sq. in. The effect of deviation upon this apparent volume has been neglected. An examination of equation (3) shows that Formula (6) should read, corrected,

$$Y = \frac{RS(P_b - P_x C_x) + P_b}{P_s}$$

where S, the number of steps, has replaced Σ, and $C_x = 1/Y_x$ = the compressibility factor for a pressure increase of 13.748 lbs. per sq. in. Assuming straight line deviation and basing Y_x upon Y = 1.1000 at P_s = 513.318, by extrapolation.

$$\frac{1.10 - 1}{(513.318 - 14.73)} = \frac{Y - 1}{13.748} \text{ from which } C_x = .99725$$

$$\text{then } Y = \frac{4 \times 10\,(14.73 - .982 \times .99725) + 14.73}{513.318} = 1.1002$$

By using formula (6) an error of −0.0002 has been introduced.

(b) Effect of deviation on gas drawn into burette.—(This type of error exists in the Bureau of Standards' apparatus but is also ignored.)

Should 9 cycles be extended to 10, then from equation (7)

$$P_b = \frac{467.233 \times 1.0908 + 10 \times 4 \times 0.982}{10 \times 4 + 1} = 13.3887$$

The effect of deviation upon the apparent volume has been neglected. An examination of equation (5) shows that formula (6) should read, corrected,

$$Y = \frac{RS(P_b C_b - P_x) + P_s C_b}{P_s}$$

where $C_b = 1/Y_b$ = the compressibility factor for a pressure increase of 14.73 − 13.3887 = 1.3413 lbs. per sq. in.

Solving for C_b as for C_x, C_b = .99973, by extrapolation, and

$$Y = \frac{4 \times 10(13.3887 \times .99973 - .982) + 13.3887 \times .99973}{467.233} = 1.0905$$

By using formula (6) an error of +0.0003 has been introduced.

(c) Effect of burette volume reduction at manometer after filling.—When metering gas at less than atmospheric pressure the volume ratio is decreased due to the mercury column displacing a part of the true burette volume. Assuming the condition in (b), the manometer differential would have been

TABLE (2)

Calibration of Deviation Apparatus

Av. Barom. 29.90 in. at 69°F. Manometer at 69°F, Bath at 72°F.

Step	(1) P	(2) M_x	(3) M_b	(4) $M_x - M_b$	(5) $P_b - P_x$	(6) P_s	(7) Y	(8) P_sY	(9) P_sY diff.	(10) R
1	371.54	−28.16	−0.24	27.92	13.662	386.171	1.0074	389.029	54.397	3.9816
2	317.84	−28.11	−0.41	27.70	13.555	332.471	1.0065	334.632	53.898	3.9762
3	264.54	−27.89	−0.20	27.69	13.550	279.171	1.0056	280.734	53.945	3.9812
4	211.12	−28.19	−0.27	27.92	13.662	225.751	1.0046	226.789	54.447	3.9853
5	157.11	−27.80	−0.26	27.54	13.476	171.741	1.0035	172.342	53.637	3.9802
6	103.79	−28.08	−0.23	27.85	13.628	118.421	1.0024	118.705	54.247	3.9798
7	49.75					64.381	1.0012	64.458		

$B_a = 0.48937 \times 29.90 = 14.631$ Average R = 3.9807

Cols. (1) to (5) inclusive are as in Table (1), P_s is the bomb absolute pressure, Col. (7) (Y) gives the deviation factors of air for the values of P_s as read on Figure (5), Col. (8) is the product of Cols. (6) and (7), in Col. (9) the difference between P_sY for step 1 and P_sY for step 2 is written opposite step 1, between P_sY for step 3 and 2 opposite step 2 and so forth, dividing Col. (9) by Col. (5) gives the value of R.

2.7318 inches, corresponding to 1.3413 lbs. per sq. in. One-half only of this differential, 1.3659 in., effects displacement. The displaced volume is $1.3659 \times .011 = .015$ cu. in. Were the incorrect burette volume expanded to the calibrated volume at level manometer legs, the burette pressure would have been

$$P_b = 13.3887 \frac{(156 - .015)}{156} = 13.3874$$

Substituting this value in equation (6) gives

$$Y = \frac{4 \times 10\,(13.3874 - .982) + 13.3874}{467.233} = 1.0907$$

The error in this case will have been + 0.0001.

(d) Effect of burette volume reduction after evacuation.—An analysis similar to (c) will show that the discrepancy in this case is but —0.0001. Although the manometer linear displacement is 14 inches the quantity of gas remaining after partial evacuation is very small. This discrepancy cannot be termed an error because the displacement occurs also during a calibration. Due to its slight magnitude it is cared for in the volume ratio as determined.

Table (3) lists the errors involved under varying conditions. It will be noted that the addition of errors confirms the statement that the total error does not exceed ±0.0002.

TABLE (3)

Approximate Apparatus' Error When Testing Gas of Initial Gauge Pressure Near 500 Lbs. Per Sq. In.

When Y is approximately 1.100 at 500 lbs. per sq. in. gauge

Type of Error	Burette withdrawal pressures for which starting pressure is suited: Atmospheric Steps	Adding ½ step	Adding 1 step
(a)	—.0002	—.0002	—.0002
(b)	0	+.00015	+.0003
(c)	0	+.00005	+.0001
(c)	0	+.00005	+.0001
Total error	—.0002	0	+.0002
When Y is near 1.000 at 500 lbs. per sq. in. gauge			
(a)	0	0	0
(b)	0	0	0
Total error	0	+.00005	+.0001

Technique in Operation of Apparatus

The accuracy of results is entirely dependent upon the care taken in making observations and upon manipulation. The apparatus is not unlike that of the Bureau of Standards in this respect. Pressures on the piston gauge should be read to one hundredth of a pound at least in the lower pressure range. Manometer differentials should be read to an accuracy of one hundredth of an inch. The bath temperature had better not vary more than a quarter of a degree. Neither piston gauge nor manometer readings should be hastily taken. Expansion of the high pressure gas is inherently adiabatic and sufficient time should be allowed for the gas to return to the bath temperature in order to insure accuracy of pressure observations.

The importance of barometer accuracy in deviation investigations is infrequently realized. It is not an uncommon experience to find a barometer, apparently in perfect condition, to be in error as much as 0.05 of an inch. If a Bureau of Standards' apparatus has been calibrated with a barometer differing by this amount from the barometer used in testing, an error of about 0.002 in the factor is introduced at high pressures. This should be adjudged inacceptable. If the same barometer is used for both calibration and testing, the error is substantially reduced. In the described apparatus the manometer reading at partial evacuation replaces the barometer reading for the Bureau of Standards' type when converting burette pressures to absolute units. Consequently, an erroneous barometer affects the absolute conversions of the piston gauge readings but not the burette volume summation, and has but slight effect at high pressures where deviation factors are more generally applied to the measurement of natural gas. Instead, a discrepancy will be noticeable at the lower pressures. An advantage would seem to lie in this fact that metered volumes are not subject to a barometric error.

Suitable variations in procedure and in the design of the described apparatus could adapt it for use as an absolute instrument. A constant volume manometer might be substituted, complete evacuation effected and initial pressures chosen so as to permit constant atmospheric withdrawals. The final data would then be based upon a factor of unity at the barometric pressure existing at the time of testing and should be corrected to refer to the desired pressure base. Commensurate precaution would favor the inclusion of the manometer and trap in the bath. Such improvements would not be without virtue; however, to realize their benefits greater precision would be necessary in all the indicating devices than which has been suggested.

Extreme Accuracy

An accuracy of this high degree is inconsistent with present metering practice. Specific gravity determinations, at their best, do not exhibit an accuracy exceeding one tenth of one per cent. Orifice meters are rarely designed or installed so as to insure an accuracy within one-half of one per cent. Temperature measurements, due to no fault of the recorders themselves, are frequently in considerable error from climatic effects. Under favorable conditions an accuracy of one-tenth of one per cent might be expected. On the other hand, experience has shown that an accuracy of five hundredths of one per cent can be consistently realized in the deviation factor. It will suffice to say, therefore, that the apparatus described in this paper having an overall accuracy equivalent to that obtainable with the Bureau of Standards' apparatus is consequently suitable for its intended field.

The reader's attention is again called to the desirability of consulting the paper by H. S. Bean, U. S. Bureau of Standards on this subject.

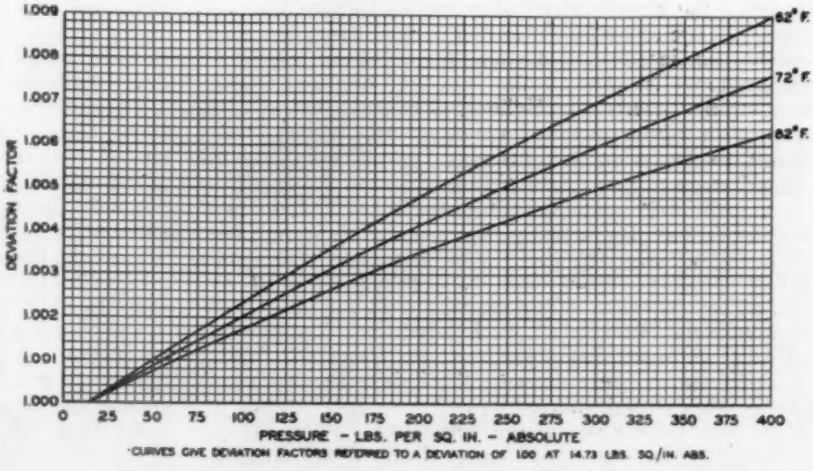


Fig. 5—Deviation of Dry Air, Free of CO_2, from Boyle's Law

Economic Attitudes of Industry

Analysis of some replies received in answer to an inquiry addressed to industrial leaders and economists

RECENTLY Ohio State University sounded out several hundred leading industrialists and economists relative to their attitude toward the social and economic implications of industry in general. This inquiry was put on foot by some members of the faculty of the College of Engineering of the University in order to broaden the education of their engineering students. Many of the questions propounded and the answers to the same are, or should be, of more than passing interest to gas company executives and key men. Accordingly, we are presenting below several of the questions and their answers in full. The entire set of questions and answers appear in The Engineering Experiment Station Circular No. 26, Ohio State University, Columbus, and all gas men who recognize the connection of the trend of the times with their own business should secure this study and ponder well over its findings. Its authors are F. C. Caldwell, Professor of Electrical Engineering, C. A. Norman, Professor of Machine Design, and John Younger, Professor of Industrial Engineering; all of Ohio State University.—Editor.

Do you, under any circumstances, believe in government ownership and operation of industries?

Business leaders: 75 "no," 4 "yes." (Ten "yes, when the security of the nation is at stake.")

Economists: 12 "yes" without qualifications, 10 "yes" with qualifications "under some circumstances," etc., one categorically "no," 2 "not at present."

It is quite clear that business leaders are not willing to abdicate private control, at least in peace time. On the other hand the great majority of economists feel evidently that there are many cases where government ownership—of the basic industries for instance— should be seriously considered.

Toward what normal working period expressed in hours per day and days per week is industry, in your opinion, tending?

Until ten or twenty years ago employers in general were rather opposed to the reduction of the hours of labor and it took some pressure from the government to make the steel industry abandon its 12-hour day. A great change in sentiment in this respect has taken place in the last decade and particularly after the advent of depression. In view of the fact that one well-known industrial concern, the Kellogg Company, has already gone to a 6-hour day and a 5-day week, it was of interest to see what the business fraternity in general would suggest as a reasonable goal.

A surprising unanimity of those answering appears for an 8-hour day and a 5-day week. Forty-four declared for this. Even the 8-hour day and the 5½-day week, until recently a very progressive standard, received only 8 votes. Four answers look for the 6-hour day and the 5-day week. All other combinations received only scattering votes.

To judge by these answers the 2-day free week-end seems an assured thing.

Do you believe in old-age pensions?

In the business group 69 categorically "yes," 6 conditionally "yes," 17 "no" with or without reservations. In the economists' group 22 categorically "yes," one "yes, for incomes below a certain level," 3 against, of these one "not now, but perhaps later."

This indicates on the whole a surprising change of sentiment in the last twenty or thirty years. One might wish that the answer of the economists would indicate that old age pensions of reasonable amount are not only desirable, but economically possible. Unfortunately this question was not asked.

An interesting commentary, however, came from a prominent executive of a well-known electrical concern. This gentleman thinks the government ought to compel all industry to set aside a reserve for old age pensions. His company carries such a reserve and does not find it unduly burdensome. Nevertheless, he does not think that his company should be penalized even with a slight competitive handicap for taking on a socially desirable responsibility.

Other answers bring up an interesting divergence in point of view. Of two persons, both responding in favor of old-age pensions, one thinks they ought to be carried by taxation "since old age is not an effect produced by industry and hence chargeable to industry but is a general human phenomenon;" the other on the contrary, feels that "admitting as we do that the fundamental purpose of industry is to support the population, industry should make provisions to support people not only during their working days, but also in their old age."

It might here be emphasized that industry now often refuses to employ men even in quite vigorous middle age. Society must then adopt some means to see that the productive power of such people does not remain unutilized. A general pension scheme resting on taxation might make industry less hesitant to hire such men since it would not have to worry about what to do with them when their working days are over.

Forty-one business leaders come out with or without conditions for pensions provided by industry direct,

although of these, 12 think that the workers should contribute. Fifteen are in favor of government compulsion in this matter, but 29 oppose it. Only 14 are in favor of pensions supported by taxation. There are a few scattering votes for contributory old-age insurance, group insurance, voluntary retirement plans, etc., as well as for combinations of the methods *a, b* and *c*.

Among the economists, the largest group, 14, are in favor of industrial insurance under government compulsion, although of these 2 think that this is not a good time to introduce such a thing. Eight favor pensions by taxation, 8 a combination of taxation and provision by industry. Only 5 believe in pensions furnished by industry exclusively.

Has there been an over-stimulation of buying by advertising and high-pressure salesmanship?

Business group: 53 categorical "yes," 5 conditional "yes," 28 categorical "no" and 2 conditional "no."

Economists' group: 26 categorical "yes" and 3 conditional "yes" against 1 categorical "no".

The answer "yes" to this question can be based on some different observations or ideas: (1) That there may have been a great many repossessions or lapsed payments, and that the increase in sales does not correspond to the increased cost of selling. It has been denied that this is true for instance in the field of automobiles. (2) That a partial cause of the depression is that people have tied up too much of their purchasing power in installments and cannot indulge in new purchases. Economists may be swayed by some such idea as this, although direct observations of selling organizations are the basic fact in this connection also. In any case there is better than a 2 to 1 majority in favor of the attitude that high-pressure salesmanship has been overdone.

Do you feel the need in your industry of a greater number of employees having had technical college training?

The answer of the business group, the only one of interest in this connection, was 53 categorical "yes," 1 conditional "yes," and 38 "no."

(a) Do you feel that an effort should be made to restrict technical college training to persons having pronounced technical talent?

Business group: 53 categorical "yes," 33 categorical "no," 1 conditional "no."

(b) Should in your opinion people be helped to slip into their proper groove in industry as early as possible and with the minimum amount of formal technical training actually needed for the job?

This question is an extremely far-reaching one from many points of view. In the first place it touches the fundamental American attitude to life. This attitude has always been that "there is plenty of room at the top" and everyone should bend every energy to reach the top of the commercial or industrial ladder. A man who does not do this is branded more or less as a failure. It is possible that this race for the summit has made Americans take life more seriously than Europeans do and that it has reduced the number of real failures and derelicts. On the other hand it has tended to rob Americans of the pride of craftsmanship and joy in craft accomplishment, and has robbed them of satisfaction in a quiet and simple life with one's fellow men. It may have freed Americans to a certain extent at least from class consciousness, but has also to some extent robbed American life of stability, character, and color. Professional men, teachers, artists, have little honor alongside of the successful business man. Success is measured in commercial returns rather than in work well done.

In college work this craving for commercial success has led to an inordinate demand for a degree. There is a great influx of students who are not really fitted for college work and take little interest in the subject matter dealt with, but wish the material advantage thought to go with a diploma. In colleges of engineering only about one-third of the freshmen admitted succeed in graduating. The remainder are compelled to leave with a half finished education, since the curriculum is built so as to give real engineering training only in the junior and senior years.

It appears that in France attempts have been made in some industries so to conduct education from the grades up that there are numerous levels at which a student can leave with an education well fitting him for a certain station in life. At each stage only those who have shown special gifts are allowed to proceed to a higher stage where these special gifts are developed. Many men with technical talent leave from a stage which fits them to be foremen, electricians, surveyors, draftsmen, etc. Only those with the highest intellectual attainments along special lines go on and become highly trained professional engineers.

The question is: Would not a great deal of wasted effort be avoided, and a great deal more genuine social and individual satisfaction and stability be attained, if the youth were advised to find his proper level as soon as possible rather than as late as possible?

It is not certain, of course, that this background of question was clearly understood by all those answering the question. In any case the answers show a considerable divergence of opinion.

In the business group there were 46 categorical and one conditional "yes" to 30 "no." In the economists' group there were 17 "no" against only two conditional "yes." Twelve economists gave no reply.

It is evident that the industrial leaders have the feeling that there is a good deal of time wasted in college, while the economists, as educators, seem to believe in as much education as possible for everybody.

That the industrial leaders in spite of their attitude do not look at education in a narrow way is very clearly shown by their answers to the question below.

Is more cultural training and a wider social outlook needed for industrial executives?

Eighty-one industrial leaders answered "yes" without reservations; 5 more answered "not needed but helpful;" only 4 answered "no."

Surmounting Cooking Competition

Some valuable pointers on how one organization is successfully combating the electric range.

GUY M. JOHNSON

Division Manager,

Northern Indiana Public Service Company, South Bend, Ind.

THE South Bend Division of the Northern Indiana Public Service Company includes the cities, South Bend, Mishawaka and Elkhart and adjacent suburban communities. It has approximately 30,000 residential gas meters and is the only division of our company that is "straight" gas. The rest of our company is mostly so-called "combination" with some territories "straight" electric.

A few years ago Mr. Morse DellPlain, President of our company, definitely established the policy for our company that gas is the logical fuel for cooking. In fact, our present policy reads that we shall sell the gas range exclusively where gas service is available and this policy applicable in our combination districts, assumes more importance still in the South Bend division where we are tremendously concerned with the responsibility of maintaining and increasing our cooking load.

Stiffer Competition Imminent

Everybody here is familiar, I am sure, with the nature of our competition; we have experienced it in a very intensive way for years and from all indications, we are due for a more determined onslaught than ever during the next three years. Just as our late fellow townsman, Knute Rockne, developed a defense to meet any particular offense and an offense to override the other fellow's defense, we in the gas business should be well equipped to meet the forthcoming offensive and there should be, on our part, little cause for serious apprehension, because if our gas cooking has the merit we believe it has, we can more than meet any legitimate competition that is offered.

As I said before, we have been meeting this form of competition for several years now. We have lost some business to it, of course, but thanks to the stimulation of this competition, we have, we feel, gained far more than we have lost in consolidating our present business and in building up a public acceptance that gas is the logical fuel for cooking.

In determining how to hold and increase the gas cooking load, it is well to review the reasons that got us the load. For, in reviewing these facts, we will find that they are equally as true today as they were yesterday.

In the first place, we didn't get the business on a cost of operation basis. The fuels our gas replaced are today cheaper and still available. *The element of cost of operation only becomes a factor when other things are equal.* We didn't get the business on initial investment, since other cooking stoves were, and are, just as cheap as ours. On what basis, then, did we get the business? It is answered in four words. *Gas cooking is better.* The reasons why it is better are familiar to everybody here. These reasons were, and still are, our best selling points. In the South Bend Division, since our competition arose, we have never let our selling points get away from us, nor have we, to the best of our ability and advertising resources, allowed them to get away from our customers.

Some of these reasons are self-evident. Speed, for example. In these days of time utilization, here is an advantage that cannot be taken away from us by any of the competition on the horizon at the present time. The only fellow who threatens us, is the inventor of an elec-

How one company, New York Consolidated, pushes gas ranges by way of attractive window display

Delivered before the Mid-West Regional Gas Sales Conference, Hotel Sherman, Chicago, Illinois, February 17, 1932.

tric water heater in our state who uses the "same juice" twice. But he is so preoccupied proving that Edison, Steinmetz and their co-workers miscounted the number of B.t.u.s in a kilowatt hour that it is doubtful if he will be able to tackle the problem.

Manufacturers Have Helped

The gas industry is fortunate that it has within its ranks a most progressive group of gas range manufacturers. I believe the development and popularization of the oven regulator was one of the biggest things that ever happened in the development of our business. My one comment is that the manufacturers, as far as we are concerned in South Bend, were always ahead of us and it was only when we began to realize that we were losing our load because of our failure to popularize the oven regulator, that we began to put real effort behind it. It seems almost tragic that it was only in the last few years that we have had any real public acceptance of the oven regulator on a gas range. Women are instinctively reactionary and I remember very vividly the intensive selling that was necessary to break down their opposition to it. I am glad we forced the issue in those days with specially trained salesmen, cooking schools, the wide use of recipe books and manufacturers' descriptive literature. I know that many a woman in those days who spent an extra $15.00 for an oven regulator on her new gas range against her better judgment, today appreciates the value of the self-same regulator and is solidly lined up in favor of gas for cooking primarily because of the value to her of the oven regulator.

We also have always appreciated the value of the replacement range business. In fact, in our straight gas properties, our management has established the policy of grouping our gas range sales under our new business activities, whereas, in our combination properties, we consider it merchandising. And so looking at the replacement range business, we know that every present user of a gas range, who purchases a modern, up-to-date gas range, besides giving us an immediate increased load of 38 therms annually, has also committed herself to cook with gas for the next ten years. The replacement range being so valuable, it is necessary, therefore, for us to see that she gets the best gas range possible according to her resources, and in consequence we have never compromised with quality. As a matter of fact, we could retail the highest quality gas range with a very adequate mark-up and still have plenty of margin to spare over our alleged competitors, and by competition I don't mean the dealers who are selling gas ranges. They are not our competitors, they are our valued allies and in establishing our own high quality retail standard, we took particular care in organizing our retailing operation, to give these dealers an opportunity to get into the gas range business with us at a profit and at the same time gave them a quality goal to shoot at. It has always been a theory of mine that the cheap gas range retailing for impossibly low prices, without the oven regulator, insulated oven or efficiency of design is a far greater menace to our cooking load than any offered by our competition. The cheap range is inevitably a product of intensive, uneconomic competition and, as far as our own retail operation is concerned, we have by precept and example done all we possibly can do to discourage it.

The question of keeping the cooking load is entirely one of merchandising technique, for, to hold and increase it, gas ranges have to be sold. I have already mentioned the importance of the oven regulator. There are other developments, from a merchandising viewpoint, that are equally significant. The organization and institution of the A.G.A. Testing Laboratory in Cleveland is another selling point of which we tried to take full advantage. While we realize the real merits of the Blue Star Seal of approval, there is no question in my mind that it has definitely raised the standard of gas ranges sold. We spent a lot of money advertising the Blue Star and I feel that by impressing its significance on our customers we built a better dealers' standard and at the same time won a further degree of public confidence in gas cooking. As other improvements came along we aggressively tried to take full advantage of them, because every improvement means obsolescence in some way or another and the life blood of all merchandising is obsolescence. The insulated oven! What a sales story we had with that! And then came the new beautifully designed consoles and table models. All of which, is excellent from a merchandising viewpoint and every improvement something on which we could build further aggressiveness in selling gas ranges. Finally, today we have the completely automatic gas range with time control, if desirable, and with it, our case for gas cooking is complete.

The pity is that merit alone is not enough and self-sufficiency and complacency because of our obvious superiority in the cooking field, are apt to prove our undoing unless we realize our story is always new to our customers and that it is our duty to keep telling it patiently and enthusiastically.

You often hear the question of cost of operation raised. Earlier in this paper, I said that the costs of operation is not a factor unless other things are equal. We are going to hear a lot more—we have already heard a lot to date—about the relative overall thermal efficiencies of the various fuels. Our electric competitors, because they do enjoy a better rating in this respect than we do, are going to make a great play with this. Already, I have seen a document issued by one of the leading electric range manufacturers particularly emphasizing the fact that the electric range has an overall thermal efficiency of 83.3%, compared with gas at 51%. This manufacturer quotes a Purdue University bulletin as his authority, but for the purpose of comparison and assuming that all other things are equal, it is not the thermal efficiency but the cost of operation that definitely counts where general usage is concerned. In a few moments, I shall substantiate that statement from our experience in the South Bend Division. For the time being, let me go back to the Purdue test and, in fairness to Purdue University, let me say, that our electric friends only told half the story. I dug up a copy of the Purdue bulletin and in it I see a companion test to the thermal efficiency test which shows that with these relative thermal efficiencies, that electricity at 3c a kilowatt hour was about twice as expensive for cooking as 570 B.t.u. gas at $1.50 per thousand.

Out Comes the Electric Range

In South Bend, last year, we started a plan of taking in electric ranges. Our management stipulated that only a certain minimum of electric ranges could be taken in, this number to be determined by the rate at which these electric ranges could be resold on our rural electric lines. A certain quality and definite standard of conditions were stipulated. The company breaks even on the proposition from a merchandising viewpoint and because of an accessible market for the electric ranges

within our company system, it is a good double-barreled load building plan. Incidentally, we can take them in much faster, so far, than our rural electric properties can absorb them.

An analysis of the reasons why people are anxious to get back to gas cooking bring out very definitely that our talking points are sound and that cost of operation is a factor in meeting such competition. Cost of operation is determined by the rate structure. Only recently, we had an apartment house change over from electric to gas cooking because the owner couldn't rent his flats, while electric ranges were there.

In our South Bend Division we have service charge domestic rates which are decidedly promotional in form. Gas for water heating is cheap because the customer uses gas for cooking. The customer is encouraged to use gas for all purposes in order to reduce his unit cost of operation on each. This is a factor of primary importance and I would say that from our experience, the best weapon of all to lick competition is a good promotional initial use of service charge rates. Another good way too, is to go after and get as big a water heating, home heating and refrigeration load as possible on the same rates, for every satisfactory use of gas in the home helps sell all the other uses for it.

Important Factors

There are two factors which we have found most important and I have left them to the last because I want to emphasize them particularly. They are worth our special thought. I refer to the educational influence on the public of two groups, our employes and our dealers.

The employes are in constant touch with the public, they are exposed to public opinion far more intimately than we are in the front office and what is more important still, what they say and do goes much further with the public than most of us imagine. Earlier on, we recognized the fact and discussed such subjects as the importance of the cooking load to them and to the company, and the merits of our gas ranges. We did our best to be sure that our employes were fully competent to argue the case for gas cooking in the field. We have plenty of evidence that our efforts were well worth our while. The dealer can and does take the most important place in our gas range selling program.

It is very obvious that we cannot begin to sell all the gas ranges in the South Bend Division, even had we the desire to do so. For years we have been interested in encouraging the dealer to sell gas ranges rather than those designed for other fuels and there are two ways in which we have done this. First, we organized our own retail organization so that the dealer has always had the opportunity to merchandise good gas ranges alongside us at a good profit. We have been most careful in this, for a dealer who leaves gas and goes over to the opposition, only increases our own job and doubtless strengthens the opposition. Second, we have made our advertising utilization in character, explaining the benefits of gas for cooking rather than about any particular appliances with a price appeal. We have, in print, month in and month out, very regular and definite schedules of advertising and keep our story of gas for cooking continuous.

Cooking School Beneficial

Every year, we have cooperated with one of our newspapers in organizing a cooking school in South Bend. This has proved a very constructive measure. In fact, we pass up no opportunity to tell our story for gas cooking and no detail is intentionally overlooked. For example, we particularly stress our "After Sales Service." We realize that no gas is permanently sold for cooking until the customer is permanently satisfied to use it for cooking.

Summarizing all that I have said this morning, you will see that it amounts to this. We do, to the best of our ability, an intensive sales promotional job of gas for cooking. We major it in our sales work because we appreciate the value of the load. The factors that help us most are:

1. A promotional form of rate.
2. Special merchandising support from our manufacturers.
3. Attention to our trade relations for utilization.
4. Advertising.
5. Majoring the activity throughout our entire work.

Jackson, Mississippi, Natural Gas Field

JACKSON, Mississippi's natural gas field, is two years old. The field contains 74 producing wells, with a daily open flow capacity of approximately two and one-half billion cubic feet daily at a rock pressure averaging slightly below 1,000 pounds.

An area of 3,000 acres is encompassed in the producing zone and as the third year of the field's development looms, a further increase in its size is believed imminent.

The 75th well in the field and one destined to extend the producing area northward in Rankin county was brought in recently. There are 21 more or less active drilling locations in Mississippi today, ten of the group being in the Hinds and Rankin area. At least four new locations are in immediate prospect in the Hinds and Rankin gas field.

The first gas showing in the Jackson area was in the Home Oil Company's Rainey No. 1 in Rankin county in October, 1929. This well was drilled by Cleve Love. The gas showing was at a depth of 2509 to 2512 and one-half feet. Returns were lost and the hole was junked.

Development of the field followed rapidly during 1930 and continued through 1931 although at a diminishing rate due to the increasing business depression. The present year is expected to again witness an upward trend in the Jackson field and other sections of Mississippi.

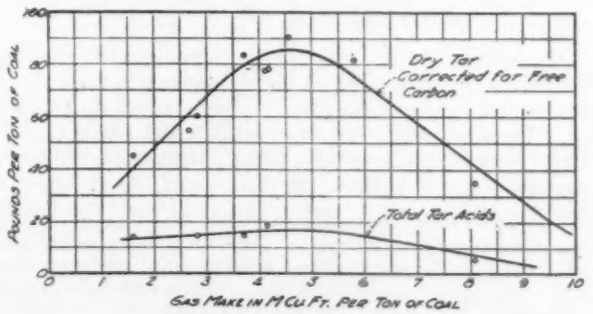
The United Gas System is the largest purchaser of natural gas in the field, this company having acquired the gas interest of the Home Oil Company and the Gulf Refining Company for a reputed price of $500,000. The firm has steadily increased its holdings.

It is estimated that some 700,000,000 cubic feet of gas is being drawn from the Jackson field monthly.

Carbonizing Fine Coal

Tests on the continuous carbonization of finely crushed coal by radiant heat in a vertical retort, by F. B. Hobart and D. J. Demorest, Battelle Memorial Institute and Ohio State University.

INTEREST in the commercial possibilities of methods of carbonizing coal at low temperatures led to the establishment at the Engineering Experiment Station of The Ohio State University of a project to investigate one of the recently proposed methods, the White process, on a scale large enough to give indications of the commercial possibilities of the process. In this process coal is crushed to a moderately fine condition and allowed to fall through a heated vertical retort. The gas, tar, and other by-products are removed according to the usual carbonization practice and the solid granular residue which collects at the bottom of the retort is withdrawn as required to give a continuous process.



Dry tar yield and tar acid content at different carbonization temperatures

Several preliminary tests were made during 1928 and 1929 in connection with student thesis work, using the U.G.I. one-ton vertical gas retort and the by-product purification and recovery equipment at the Station. Ohio No. 6 coal from the Sunday Creek Coal Company was used. The results were sufficient to warrant continuation of the work.

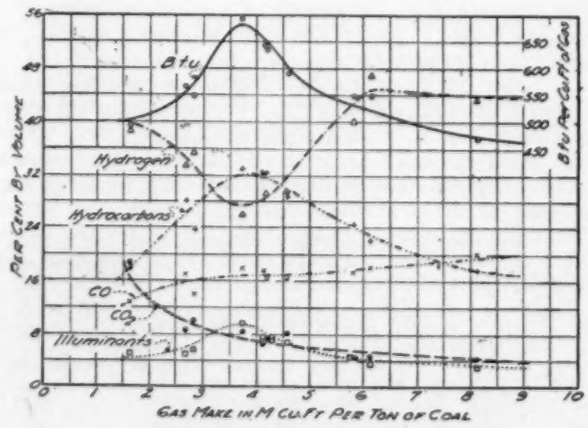
In 1930 a cooperative arrangement for continuing the experiments was made between the Station and Battelle Memorial Institute. The equipment was modified to make it more suitable for the tests and these were continued on Ohio, West Virginia, and Illinois coals.

This study was undertaken for the purpose of determining the economic possibilities of the White process. In addition, the effects of varying retort temperatures and coal sizes were studied. The capacity of the retort was a further object of inquiry. It was not considered that the work would be a complete and conclusive survey of all the possibilities of the process, but rather that it should indicate the commercial possibilities and the trend that any similar future investigations should take.

(1) The rate at which coal can be carbonized in a retort by the White process is not appreciably greater than with the usual intermittent operation of the retort and is indicated to be at about the ratio of 8:9 hours for comparable carbonization in this retort. The limiting factor is the rate at which heat can be forced through the retort wall. The only advantage of the White process is elimination of the insulating effect of a mass of coal or coke in the retort when a full charge is used.

(2) Difficulty was encountered in the tests when caking coals were used, because of the particles becoming pasty and sticking to the retort wall. At lower temperatures some trouble from this cause was had with non-caking coals, an indication that high wall temperatures make possible the use of coals of stronger caking properties. It was found that dust carried from the retort by the gas stream could be removed from the gas by electrostatic precipitation at temperatures above the condensation point for the tars.

Other investigators have reported little trouble with the sticking of coal to the walls. The probable reason for this variation between the results of the tests reported in this bulletin and those of other investigators is that the latter used metal or silica tubes for retorts and fed coal at such slow rates that there was little temperature drop in the wall. Apparently metal tubes wou'd also make possible the use of coals with greater coking properties.



Gas composition and B.t.u. value at different carbonization temperatures

Retorts of heat-resistant metal, thin-walled silica or Carborundum shapes would be superior to those used in these tests because they would have greater heat conductivity and, consequently, give higher available temperatures.

The full report by these authors, from which this material is taken, is published as Engineering Experiment Station Bulletin No. 65, Ohio State University, obtainable at 50 cents per copy from Engineering Experiment Station, Columbus, Ohio.

(3) The products of chief value from these tests are residue (coke), gas, and tar.

The residue, as produced, is not suitable for combustion, but must be powdered or briquetted. Its low apparent specific gravity makes it unfavorable for briquetting without grinding.

The gas produced would normally be little more than sufficient to supply the necessary heat for the carbonizing.

The tar is similar to ordinary coke-oven tar, except that it contains larger amounts of tar acids when produced under optimum conditions. Under the best conditions, also, the yield of tar is somewhat higher than that reported from the same coals by usual carbonization methods, the comparison being 8.5 to 7.5 gallons per ton for maximum yields from Ohio No. 6 coal.

(4) White has suggested the process as a pretreatment in coking poorly coking coals. The results of these tests indicate uncertainty as to the feasibility of this idea because of probable sticking of the particles to the pretreating retort wall.

(5) When this problem was undertaken it was felt that its economic justification was slight, but that the technical interest which had been shown in this and similar processes justified experiments on a semicommercial scale as a means of indicating the true commercial possibilities.

The results obtained are not encouraging to the process when considered under present economic conditions. The future possibilities cannot be predicted. It is hoped that these results will be of value to those who are interested in this method of carbonization.

Does Present Economy Threaten Future Profits?

(Continued from page 33)

fancies, for both the household user and the industrial user audiences of America. A campaign for gas comparable in magnitude with the combined campaign for automobile merchandising would not be out of order. The ultimate objective should be a program intended to produce major changes, not mere moderate increase in sales.

4. *Sales Staffs.*—The building of a properly paid, properly trained, personnel for the industry as a whole as a basis for utilization equipment sales. For industrial work the sales force should include on a national basis specialists in every type of industrial heating, who not only would be available for, but actually *used* by, all the major gas companies and their subsidiaries to reach every major prospect who is worthy of attention at any point of the United States.

Some people will unquestionably believe that such a program as just outlined is visionary and impractical. That is probably an all-too-typical reaction to any sweeping change, wherever proposed. It is far too easy to be content with modest successes such as those which the gas industry has unquestionably had. It would be far better to have a certain measure of wholesome discontent with recent progress.

Unless a program be sufficiently radical and sufficiently large and costly to make a major impression upon the problem it would probably not be worth serious national consideration. Local companies are already doing, under the more progressive managements, as much locally as can be hoped for from minor, small-scale efforts. If the industry is going to be content with that type, they must not expect major developments; and they must anticipate that the rate of increased profits will be small, or that profits may altogether disappear in the early future under the competition of other energy supplies.

New Water Gas Plant Placed in Operation by Consolidated of New York

THE capacity of the Hunts Point Plant of the Consolidated Gas Company of New York was doubled on Wednesday, January 20, when a new 30,000,000 cubic foot water gas plant was placed in operation by George B. Cortelyou, President.

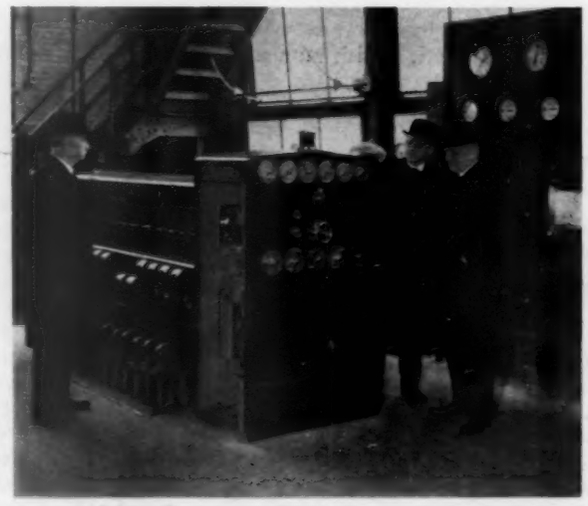
Before this time, the Hunts Point Plant was devoted exclusively to the manufacture of coke oven gas. The first two batteries of thirty-seven coke ovens each were started in November, 1926, and an additional battery of thirty-seven ovens was placed in operation in January, 1931.

With the completion of the new water gas plant, the daily capacity of the Hunts Point Plant will be approximately 60,000,000 cubic feet.

The traditional practice of the Company in starting new units from the fires of the old ones was carried out in the case of the new plant. This custom dates back to 1848, when the company's second gas plant at 21st Street was started with live coals transported from the original plant at Canal Street.

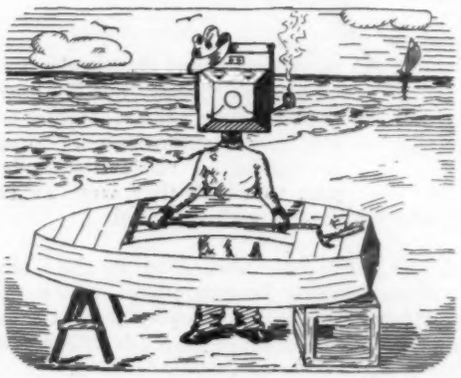
The new water gas unit is made up of a generator house equipped with six of the latest type water gas sets, each with a daily capacity of five million cubic feet, and the other necessary apparatus and equipment.

The new water gas plant was constructed and installed by the Bartlett Hayward Company of Baltimore, Md.



George B. Cortelyou, President of the Consolidated Gas Company, presses the electric button to place the new Water Gas Unit in operation. Wm. Cullen Morris, Vice-President is in the center, and John A. Garver, Trustee of the Company, is at the left

AMERICAN GAS MERCHANDISING ALMANACK



1932

April

APRIL is or has always been a good month for the fellow who will PRESS ON and talk to home managers about buying new gas ranges, a storage automatic water heater, about a laundry dryer, one of those new gas pressers for ironing the family things and a dryer for days when the wash is all ready for the lines and there comes an April shower.

April has always been a good selling month and we can see no good reason why April 1932 may not be made a good selling month. We do admit that it may take a heap more PRESS ON, than we were wont to employ in days past, yet we do think that President Hoover's plan may have the effect of bringing some money out of hiding and cause folks to buy things they need, if we will just continue to PRESS ON and show them that they need them.

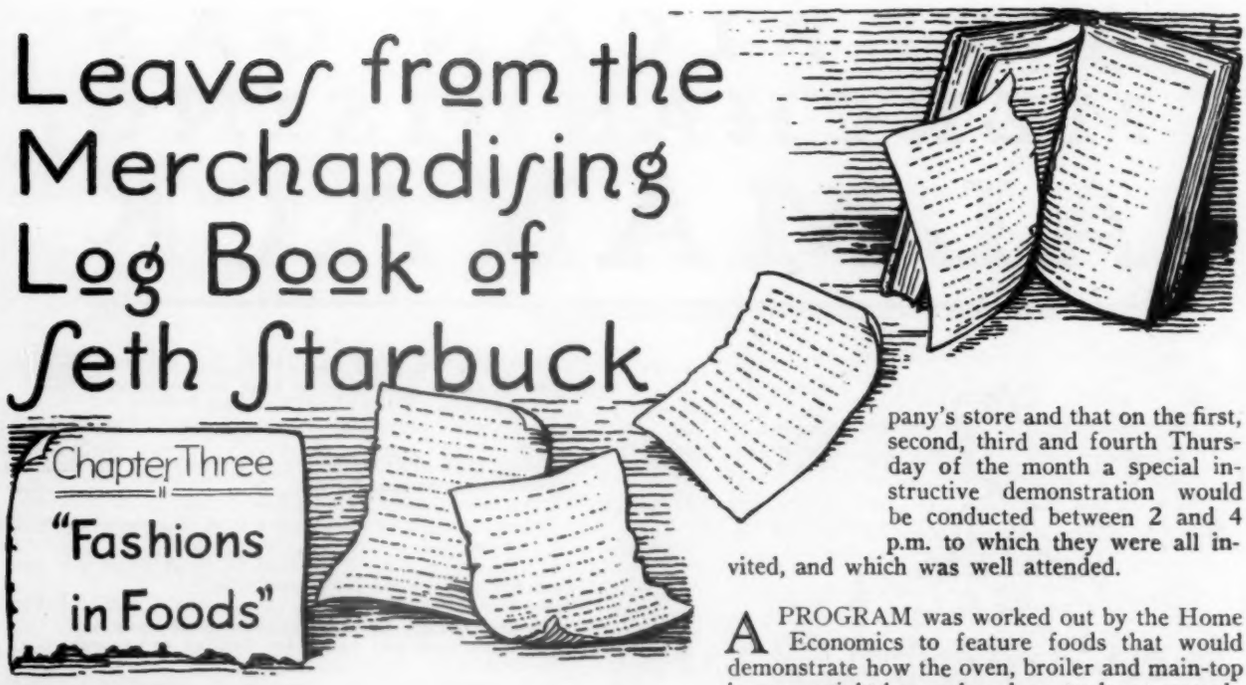
We should know pretty well where we stand by now, we should have an idea of about where and to whom we may offer our wares and we should have come to the realization that if we PRESS ON we can do something of a job.

Show your merchandise in bright settings, show it often and advertise to the limit. If you ever used advertising you realize that it is no business for the quitter. You know that it will work for you if you treat it right. You may have heard that the late Wm. Wrigley spent $10,000.00 a day to keep folks chewing Spearmint and that he realized that if he had a total saturation he would have to keep on advertising to retain and maintain sales to the tune of $30,000,000.00 per year of a five cent article.

Come on, let's all get our ear off the sod and PRESS ON, we need that cooking, laundry, incineration and water heating business.

1—Fri.	**Send out some direct mail advertising; get your merchandise in shape to display in your windows tomorrow.**
2—Sat.	U. S. Mint established, 1792. **Don't hoard your coin. If you need something buy it.**
3—Sun.	Low Sunday.
4—Mon.	**Get an early start. Resolve to PRESS ON for new gas users and new uses of gas.**
5—Tues.	Elihu Yale, philanthropist, born, 1649. **Do your trucks all carry some type of advertising?**
6—Wed.	U. S. declared war with Germany, 1917. **If you are to have a Fashion in Food Show get your advertisement in today's newspaper.**
7—Thur.	First public demonstration of television, 1927. **Special cooking demonstration in your store.**
8—Fri.	**Get advertisements ready for Sunday newspapers.**
9—Sat.	General R. E. Lee surrendered, 1865. **Talk things over with sales people regarding activities for next week.**
10—Sun.	**Drive past your store, give your window displays the once over.**
11—Mon.	**If you are to change your displays get them lined up today. Lay out newspaper advertisements.**
12—Tues.	**Check over sales with same period last year; look for things that increased or decreased them.**
13—Wed.	Thomas Jefferson, President, born, 1743. **Check advertisement in newspaper.**
14—Thur.	President Lincoln assassinated, 1865. **Be on hand at Fashions in Foods Show.**
15—Fri.	Titanic Sunk, 1912. **Go over reaction of yesterday's visitors with home economist and sales people.**
16—Sat.	**Check over new window displays and re-arrange sales floor exhibits.**
17—Sun.	Virginia seceded, 1861.
18—Mon.	San Francisco fire, 1906. **Get an early start and PRESS ON.**
19—Tues.	**Check-up! If weak spots in your plan have developed, boost them up at once.**
20—Wed.	**Go over all details for tomorrow's Fashions in Foods Show; see that recipes and other advertising material is at hand.**
21—Thur.	**Attend demonstration and talk to visitors; see what their reactions to your activity are.**
22—Fri.	**Go over your newspaper advertising; if you have come to any new conclusions as to matter of appeals embody them in your advertisements.**
23—Sat.	Canada uses postage stamps for first time, 1851. **See that all direct mail advertising has been sent out by today.**
24—Sun.	First newspaper issued, 1704. **Look over and carefully read your newspaper advertisements.**
25—Mon.	**Get everything lined up today to close the month with a good record.**
26—Tues.	Last Confederate army surrenders, 1865. **Use the telephone to bring folks in to your last Fashions in Foods Show, Thursday.**
27—Wed.	U. S. Grant born, 1822. **Go over all plans for tomorrow's show; arrange for a full force to be on hand to show folks your new ranges and give them recipes and other advertising matter.**
28—Thur.	Napoleon exiled to Elba, 1814. **See that all is in readiness for last demonstration in afternoon. Impress sales people with the fact that these demonstrations afford them unusual opportunities to sell and develop new prospects.**
29—Fri.	**Go over activities for May, check every item on your "Things to Do" list.**
30—Sat.	George Washington inaugurated, 1789. **End of April activity. All set to PRESS ON in May.**

Leaves from the Merchandising Log Book of Seth Starbuck



Chapter Three
"Fashions in Foods"

WHILE we do not pose as a prophet, we predict that if the gas man has had his ear to the ground during the past three months that right about now he has his shoulder to the wheel and that he is going out to make the most intensive effort of his life to sell gas cookery.

We have arrived at this conclusion from talking to a number of gas men who have decided to give up looking at the corner where business is supposed to make an appearance and to manufacturers who have been doing a lot of laboratory work during the past few months.

1932 offers, in the way of innovations in design, color, workmanship, and price, the greatest array of "regular gas ranges" that the industry has ever seen. Then on the other hand, 1932 gas ranges have more to offer the user than at any other time. Beauty of line, color, insulated ovens, automatic features, new, fast main-top burners, more compact and efficient oven regulators are but a few of the things the alert salesman has to present to the housewife—to say nothing of the most unusual price. As we view it, there are enough features in the 1932 gas ranges to increase sales in a way that has never before been possible. And you may take it from us you are going to hear of some record-breaking sales this year.

A NUMBER of years ago the new Business Manager of a mid-western gas company conceived the idea of featuring gas ranges through an appeal of *fashion*. Observing that dress manufacturers, milliners, perfumers, shoe-makers and home furnishers all used fashion as a major appeal, one that would click when they wished to introduce a new product or a new use for an old product in a modern package, he reasoned that women as a rule had a strong urge to be in fashion. Reasoning so, and having purchased a new line of up-to-the-minute gas ranges, he resolved to try out the idea of putting fashion in foods and this is the way he went about it.

He laid out a plan to acquaint all gas users with the fact that during the month of April a special exhibit of three new gas ranges would be held in the gas company's store and that on the first, second, third and fourth Thursday of the month a special instructive demonstration would be conducted between 2 and 4 p.m. to which they were all invited, and which was well attended.

A PROGRAM was worked out by the Home Economics to feature foods that would demonstrate how the oven, broiler and main-top burners might be employed most advantageously and efficiently. A typical menu was as follows:

MENU

FIRST WEEK

Chicken en Casserole
Glazed Sweet Potatoes
Caramel Custard — Caramel Sauce
Angel Food — Orange Marshmallow Sauce
Chocolate Fudge Cake

SECOND WEEK

Roast Beef
Franconia Potatoes — Spring Salad
North Carolina Corn Cakes
Strawberry Shortcake — Raisin Crullers

THIRD WEEK

Almond Cream Soup
Broiled Fish — Paprika Potatoes
Apple Muffins — Pastry
Moulded Fruit Salad

FOURTH WEEK

A Dozen Varieties of Breads and Rolls

Note: Recipes for any food demonstrated may be had for the asking.

This menu was sent to all customers along with an announcement of the Fashion in Foods Show during the latter part of March.

THE only other advertising done consisted of a three column by six inch announcement in the daily newspapers the day preceding each special demonstration. However, store windows played-up by special displays each demonstration a week in advance and special exhibits were arranged in the store. The store displays consisted of cut-out, poster type backgrounds for the new ranges being featured. The feature ranges were mounted on platforms raised about three inches from the floor. The backgrounds were painted in neutral colors and the cut-outs consisting of fruits, fish, and other foods were in colors, while the platforms were painted in bright colors with a border and the elevations

** Where there is no display company, background such as described above may be made of prestwood or some other type of composition board and painted with water colors; the cut-outs may be made by pasting lithographed reproductions of various foods to the same kind of board and sawed or cut out and mounted on the backgrounds.*

in dull black. The ideas for these displays were worked out by the sales manager and turned over to a local display company for painting and building.* The window displays while featuring the new gas range were built with back-grounds symbolizing spring and what the great out-of-doors offered the woman who owned a modern gas range. The interior displays played up price, heat control, speed of top-burners, cleanliness and new design.

ALL sales people were instructed to talk about the new line and to dwell on the "features" such as beauty of line, color trims of fashion and swing their talks around to such other features as speed of cooking, oven control, etc.

Fashion was also subtly injected into all talks with prospective customers by referring to the fact (once the sale got under way) that certain women, well known in the community had purchased such and such models and trims to conform with certain decorative schemes employed in their kitchen.

Terms during this activity were one-thirteenth down and the balance payable in twelve equal monthly payments.

Starbuck's Rebus—Answer on page 55.

Summary of Address "Public Utility Merchandising" Delivered by Geo. E. Whitwell

ON February 9th Mr. Geo. E. Whitwell, Vice President in Charge of Sales of the Philadelphia Electric Company and Chairman of the Pennsylvania Utilities Merchandising Committee, delivered an address on the merchandising of gas and electric appliances by utilities to the convention of the Pennsylvania and Atlantic Seaboard Hardware Association, composed of dealers from Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia.

Mr. Whitwell said that much of the controversy attending his subject was due to a lack of understanding and to the utilities' failure to make known their aims and policies. He reviewed the history of the gas and electric industries and emphasized that constantly increasing acceptance and use of appliances are essential to further economies in the production and distribution of utilities' services if the public is to benefit by lower rates.

"The costs of power and gas are established more by the acts of the consumer than by the efficiency of the producer," explained Mr. Whitwell. "The tremendous investment in equipment and the man-power required to satisfy peak demands become a burden in the absence of steady consumption. The controlling factor is not in the generating plant. It is at the other end of the line—a switch or a valve in the consumer's premises."

Burden Upon Utilities

Mr. Whitwell recalled the reluctance of the public to accept new appliances as they were invented and placed on the market, and claimed that the burden of popularizing them was and still is upon the utilities.

He then told of the large number of retailers who were attracted to the sale of appliances after the promotional efforts of the utilities had created a demand.

"The retail census recently made by the Department of Commerce indicates that there are at least thirty-five different kinds of stores in which electrical merchandise is sold." Mr. Whitwell said further that these stores sell from 70 per cent to 90 per cent of all appliances.

After describing the unusual competitive situation which prevails in the appliance business, and emphasizing that the utilities sell from 10 per cent to 30 per cent of the total appliance sales, he said:

"Yet the utilities, although only a minority factor in the situation, are commonly thought of as the 'bad boys' in this picture. On the contrary, since our efforts result in the sale of only 10 per cent to 30 per cent of all appliances, without which there can be no gas or electric revenue, we are indeed poor business men if we permit our own merchandising activities to adversely affect those retailers who put by far the largest number of appliances on our lines . . . . . I will frankly admit that in the rapid building of the utilities' domestic load, many mistakes were made in the conduct of utility merchandising activities. It was only human that that should happen. Most of those ill-advised policies, however, were voluntarily abandoned by offending utilities long before this subject became of interest to various trade organizations. It seems . . . . . that all utilities are blamed for certain unsound activities on the part of a few."

Mr. Whitwell briefly reviewed the activities of the American Gas Association and the National Electric Light Association in their efforts to establish sound

merchandising policies in the gas and electric industries. He continued with a detailed explanation of the merchandising principles adopted by the Pennsylvania utilities. These have to do with the quality of appliances to be sold, the methods of establishing retail prices, exclusive franchises, premium and trade-in offers, cooperative advertising, installment terms, collection methods, compensation of salesmen, selling methods, and the accounting practices of utilities.

"The announcement of these principles," Mr. Whitwell said, "is in some instances your first knowledge that the utilities have never done some of the things of which they have been accused. In other respects it is your first knowledge that certain practices are being discontinued. In all cases it is your assurance that the utilities will adhere to sound merchandising principles."

In touching on the situation in Kansas and Oklahoma, he said:

"Things can easily be legislated out but it is difficult to legislate things in. . . . . The place to settle differences such as we have here is around a table. Too often, in recent years, has the government been asked to step in and prohibit, regulate, or conduct business enterprises. Every time that is done a further burden is loaded on the public. Taxes per capita now amount to $110 per year—about $40 per month for the average family. In the period during which private development of the electrical industry has brought about a saving of one half in rates the cost of government has been multiplied by three.

"No one can criticize an individual for fighting for what he believes is right. In this particular controversy I have the highest admiration for those of you who have brought your grievances directly and frankly to the utilities. I believe you have found them to be friendly and willing to adjust situations to your advantage. I believe that any bitterness attending this subject has arisen from the activities of professional agitators. Let me suggest that you make sure that the stories you read and hear regarding the activities of utilities are based on facts. Let me further suggest that you analyze the motives of those who spread gossip and half-truths. Controversial situations sometimes attract men who are quite willing to prostitute the reputation and influence of well known associations, such as yours, for personal gain or political favor."

Dealer Must Exert Himself

Mr. Whitwell concluded by pointing out that aggressive merchandising of gas and electric appliances would increase the profits of alert hardware dealers and said that while the utilities "are quite ready to lead the way in advertising, promoting, and building a market, the individual dealer will profit in direct proportion to his own efforts."

At the final session of the Convention a resolution was unanimously adopted expressing appreciation to Mr. Whitwell for his address, his interest and warm spirit of cooperation. Arrangements were made to send a copy of his address to each member of the Hardware Association. The resolution said further:

"It is earnestly recommended that this association and its individual members, give serious study to this address, to contact the local utility outlets, cultivate a closer cooperation and friendly spirit with the local utility authorities, to inaugurate an alert and aggressive sales policy for merchandising electrical appliances."

Urge Repeal of Law Prohibiting Sale of Merchandise by Utilities

AT a meeting of the Kansas Press Association, held at Wichita, Kansas, January 15-16, 1932, a resolution was passed by almost unanimous vote of the editors urging the repeal of the Kansas law prohibiting the sale of merchandise by utilities.

The resolution is set forth in the following clipping from the Wichita (Kansas) Beacon, January 17, 1932.

Denunciation of the law known as the "utility merchandising act" whereby public utilities companies are barred from selling merchandise other than the public utility supply, was contained in the resolutions passed by the assembly of the Kansas Press Association.

"On the grounds that it is depriving cities and towns of adequate service and contributing to empty store rooms and unemployment, we urge the repeal by the next legislature of the law known as the utility merchandising act," was the resolution.

"Believing its operation has been a detriment rather than a benefit to the communities," members expressed themselves as distinctly in favor of repeal of the law. Members, speaking from the floor, asserted that since the public utilities companies were not allowed to sell merchandise, the business was going to mail order houses and chain stores, instead of to the local hardware stores, as original supporters of the legislation predicted.—*Missouri Assn. of Public Utilities.*

Physical Chemical Properties of Methane

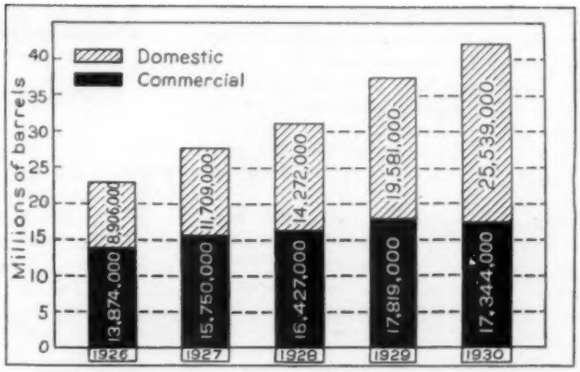
METHANE is the chief constituent of natural gas, and large quantities of it are also obtained in coke-oven gas and in the off-gases from cracking higher hydrocarbons. Perhaps the most important potential chemical use of methane is in the production of higher hydrocarbons, both aliphatic and aromatic. The results of a relatively large number of researches have been published in the technical and patent literature on the thermal decomposition of methane, the objective being an industrial process for the production of "antiknock" motor fuel. No industrially feasible process has, however, been developed.

An inspection of the literature on this subject indicates that the chief difficulty in the way of accomplishing this object lies in controlling the decomposition so that undesirable products are eliminated. A considerable number of quantitative experiments have been reported, the results of which provide only a vague and confusing picture of the various steps in the thermal decomposition of methane. The reaction mechanism has not been subjected to rigorous fundamental study, and the necessity for such a study is obvious if further progress is to be made.

The thermal decomposition is only one of the reactions of methane which are of potential industrial importance and which require further fundamental investigation. The oxidation, hydrolysis, and halogena-

tion of methane are other reactions which must be studied further.

Information Circular 6549, U. S. Bureau of Mines, presents a brief critical review of the more important data on the physical and chemical properties of methane, the primary object being to provide an introduction to further research on the utilization of waste natural gas. Perhaps the most interesting section of this review concerns the thermal decomposition of methane. Some suggestions concerning the mechanism of this decomposition are presented. The first section of the paper presents the thermodynamic properties of methane, and subsequent sections discuss the thermal and electrical decompositions, the oxidation by oxygen, carbon dioxide, and metal oxides, the hydrolysis by steam, and the synthesis of hydrogen cyanide in the electric discharge from methane and nitrogen.



Oil Deliveries for Heating of Buildings, 1926-1930
National Survey of Oil Distribution

F. M. Rosenkrans, Chairman

Ideas From The 1932 Mid-West Regional Gas Sales Conference, Chicago, February 16 and 17, 1932.

SALES activities of the gas industry must be a major offensive action, not a rear guard defense, if the industry expects to hold the load it has, even without gaining ground over competing fuels.

Economic changes may cause the industry to lose the cooking load, but, while the number of kilowatt hours of electricity generated for each customer decreased three and five-tenths per cent from 1920 to 1930, gas sales to each customer increased four and seven-tenths per cent. Losing the lighting load injured the industry because no aggressive action had been waged to increase the uses of gas. It is the fault of the gas industry that the present is not a "gas age."

Advertising, to be effective must advertise appliances, not as appliances, but at part of home modernization.

Key specific sales appeals to gas as a way to enjoy life more completely.

Constructive planning will be required during the next few years.

Water heaters are purchased from a prospect's marginal income; consequently, intensive sales effort is required on the part of the salesman and the advertising.

If we would pull the beam from out our own eye, we would have greater success pulling the mote from the customer's eye. Too few of our own employees use any gas appliances except a range and a tank water heater. Sales managers expect salesmen to sell modern equipment while still using antiquated appliances in their own homes.

Owners of large buildings, generally, do not admit the collateral advantages of gas for volume water heating. Such prospects talk, and listen to, dollars and cents.

A complete unit for heating by gas and cooling and dehumidifying by gas is now available. Year-round air conditioning belongs to gas. Although there will be many demands for this equipment, advertising and sales effort will be required, too.

Most heating contractors are willing to admit that they are not completely informed about gas heating. Because they want accurate information, the gas company man who contacts them must be competent to advise on any phase of gas heating.

The gas company that concentrates on central heating plants is missing a large part of the heating load. In many small communities, more than half of the gas used for house heating is burned in equipment other than central plants. In any community, the smaller pieces of equipment deserve as much pushing as the larger installations.

Combination gas and electric companies will probably follow the lead of those combination companies that have already ceased to sell electric refrigerators and are concentrating upon gas refrigerators. The theory seems sound: electric refrigeration is energetically advertised and aggressively merchandised; that load seems destined for the electric lines. Gas refrigeration, although not experimental, is still promotional and can be presented even more interestingly than electric refrigeration.

A good refrigerator adds about twelve therms a month to a customer's use of gas service—and at a load factor of about eighty-five per cent. (By the way, when did you ever before read a consumption figure that was really significant?)

In the modern kitchen, a refrigerator operated by the equivalent of an automobile engine is as obsolete as a coal stove.

Companies contemplating the introduction of natural gas will do well to publicize the great cost of transmitting natural gas. The rates in natural gas districts plus the efforts of anti-utility editors lead too many customers to believe that they should be served natural gas at five-and-ten rates.

Cost of operating modern gas appliances in the home is a sales factor only when other factors are equal.

Pushing oven heat control is one offensive that increases the load on the production and distribution facilities.

Service charge rates with highly promotional features help in building the load.

What the employee says and does goes farther with the public than most front office men can imagine.

New gas appliances open broader channels of usefulness than ever before to the gas company and to the customer through improved design that presents outstanding value and service.

Greater use of manufacturers' helps, more local sales planning, more active supervision, and commissions based on the load building value of an appliance are not the least of the offensive weapons for the gas industry to use. We cannot miss completely, because there are fifty times as much to get as we now have.

A sixty-gallon water heater sold to an old couple in a five-room house is as conducive to dissatisfaction as a twenty-gallon heater in a three-bath home with five children in school.

Sales of tank heaters are on the decline and sales of automatic water heaters are increasing.

The gas company that fails to cooperate with contractors, particularly the speculative home builder, is not only muffing an easy catch but is remiss in its duty to its prospective customers. When economic conditions require both husband and wife to work, homes completely equipped with automatic gas appliances are absolutely imperative—and in many cases are demanded. Blocks of scores to hundreds of all-gas homes have been sold by builders, when other builders, who installed only ranges, lost their shirts.

Local dealers and merchandising departments of local utilities are still beset with the same devils that have pestered past efforts at co-operation.

Two-thirds of the state legislatures have passed or are considering some form of bill to prohibit or to limit merchandising by utilities. To date, there is no report of action by any of these august bodies to compel the local merchant to pioneer appliances that will not only bring greater comfort to customers but also permit the utility to prosper and to improve its services.

Few housewives will spend additional time at the gas range just to be present to hear the cuckoo clock coo.

Until the gas company can make a merchandising profit on an appliance, other dealers will not sell it.

Promotional equipment becomes merchandise as soon as it is sold by the department stores.

If the utility gives uneconomically long time payments on gas equipment, the utility should discount the local merchant's paper so that he, too, can offer long terms.

Manufacturers Decide Not to Exhibit at Fall Convention

THAT gas appliances will not be exhibited at the annual convention of the American Gas Association this fall was the decision of the manufacturers at their meeting in Chicago February 18. The decision was not reached without considerable debate, however, as was indicated by lively discussion outside the meeting.

Some argued that a depression period is not the time to take such action, which might possibly weaken the convention. Others claimed the expense to be far too great for the meager returns. Some favored displays in hotels; others believe that too few gas men look at the appliances. After the discussion was completed, the opponents of a display carried the question overwhelmingly.

Out of the day's session, however, came a decision from the range manufacturers to cooperate in a national advertising campaign that will stress the modern gas range. Financing the campaign will probably be done by adding a flat sum to the price of each range sold by the manufacturer.

Discussion of appliance approval indicates that the appliance sent to the American Gas Association Laboratory at Cleveland is usually the first one off the production line. Before this one is tested, several hundred may have been shipped; difficulties occur later in the customer's home. It was stated that the laboratory agrees to rush the tests, if the appliance is sent to them early.

A plan to pool patents for cross licensing was proposed, a plan similar to the National Automotive Chamber of Commerce. Each member would contribute a nominal sum and receive stock in the Gas Appliance Manufacturing Corporation.

Manufactured Gas Expansion in Michigan

Twenty communities were added during 1931 to the list of Michigan towns served with manufactured gas, according to a review just completed by the Utilities Information Bureau. Gas service was extended to them as part of the expansion programs inaugurated by various Michigan gas companies during the past five years. These programs have been based upon the recently developed practice of carrying manufactured gas from central producing plants to outlying towns through high pressure mains.

The 1931 expansion operations were scattered through the lower part of the state from the Thumb district to Southwestern Michigan. Approximately 270 miles of high pressure mains were built to carry the gas cross country to the towns to be served.

The new gas towns and the companies and plants serving them are as follows:

Caro, Vassar, Reese, Richville, Bridgeport, and Frankenmuth, Consumers Power company, Zilwaukee plant.

Capac, Dryden, Atlas and Goodrich, Consumers Power company, Flint plant.

Oshtemo, Lawton, Decatur, Paw Paw, Lawrence, Hartford, and Bangor, Consumers Power company, Kalamazoo plant.

Ovid, Michigan Federated Utilities, Owosso plant.

Coloma and Watervliet, Michigan Fuel and Light company, Benton Harbor plant.

York township and new Ypsilanti State Hospital, Washtenaw Gas company, plant at Ann Arbor.

The Michigan Federated Utilities line from Owosso runs to St. Johns, which hereafter will be served from Owosso, the old St. Johns plant being abandoned. The line will be available to serve Shepardsville. The Vassar line of Consumers Power company will be available to serve Tuscola and the Caro line will be available to serve Wahjamega.

In the Upper Peninsula, the Michigan Gas and Electric company built a high pressure line from Marquette to Negaunee and Ishpeming, which will be served from a new plant at Marquette now in final stages of completion. The old plant at Ishpeming, which has long served Ishpeming and Negaunee, and which served Marquette during the construction of the new plant, will go out of commission.

Two high pressure natural gas lines were built. One, 40 miles long, was constructed by Consumers Power company from the Broomfield township gas field to Midland. The other, built by Gas Corporation of Michigan, connects Mt. Pleasant, Clare and Rosebush with the Vernon township gas field. The latter takes the place of the old line which formerly carried manufactured gas from Mt. Pleasant to Rosebush and Clare.

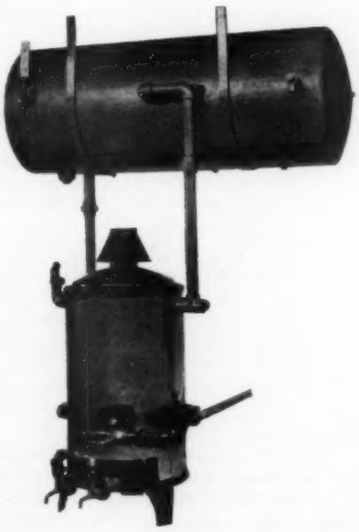
Because of the changes enumerated, three gas manufacturing plants have been retired—those at St. Johns, Mt. Pleasant, and Ishpeming. In the cases of St. Johns and Ishpeming, service is given from newer, larger, and more efficient plants, and in the case of Mt. Pleasant natural gas is being supplied.

The total number of Michigan communities now having gas service is 283 as compared to less than 80 six years ago. In addition, service is provided for a number of rural residents of townships across which the high pressure mains have been laid.

EQUIPMENT NEWS

New Commercial Water Heater

The P. M. Lattner Manufacturing Co., Cedar Rapids, Iowa, announce a new H. E. flueless gas direct circulating system water heater in sizes ranging from 70 G.P.H. to 500 G.P.H., which is a new application of the Lattner H.E. flueless industrial gas boiler.



But few changes were necessary in the boiler to accomplish the desired result. The same one hundred pound boiler code construction is maintained which permits the heater to witnstand the higher water pressure experienced in building installation. The Flueless heating elements are carried to the top of the shell to give maximum heating surface. The removal of the steam boiler controls and the addition of automatic water heater controls has been made. Either high-low controls or off-on controls will be optional.

The claimed advantage for the patented H. E. Flueless construction is no coils, no tubes and no passages to fill up with lime, scale or sludge. Efficiency tests performed by the Company show the heater to be well within the required limits.

Detailed information will be mailed on request.

A Tool Box Designed for Gas Company Use

The Littleford HanDeeBox should be of particular interest to gas distribution superintendents. It is our understanding that Littleford Bros., 424 E. Pearl St., Cincinnati, Ohio, the manufacturers, made a careful study of the needs of gas distribution crews before this box was designed. Practical gas men were frequently consulted as work on the box progressed.

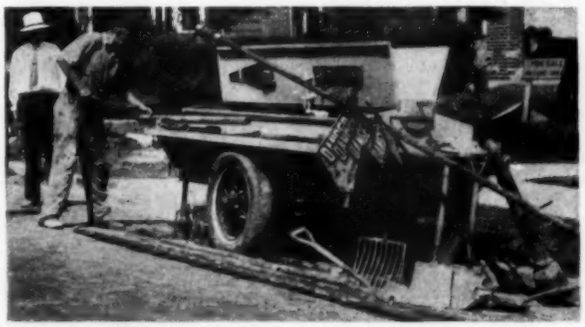
The HanDeeBox is made of steel and has one lock that simultaneously fastens both double covers full length of the box. It is practically impossible for unauthorized persons to gain access to the tools and equipment locked in the box.

Inside the box there are shelves and compartments that will take care of the most complicated collection of tools. The outer shelves, extended completely around the box. These shelves are reenforced to support pipe, vices and other bench tools. They also serve to protect the body of the box.

The HandeeBox can be trailed at high speeds. It is equipped with semi-elliptical springs, Timken roller bearings and pneumatic tires.

Lantern guards protect lanterns and lock them to the box. The wheels can also be locked to the box when it is left on the street.

This tool box is completely described in Bulletin No. G-6, a copy of which may be obtained by writing to the manufacturer.



New Steel Needle Valves

The Lunkenheimer Company, Cincinnati, O., has developed two new steel needle valves for high pressure gas or liquid service.

These valves are designed to give accurate throttling and regulation at pressures up to 3000 pounds at 150°F. The construction is exceptionally heavy with extra long pipe threads. They are used extensively on orifice meters for measuring gas and on other high pressure instrument lines.

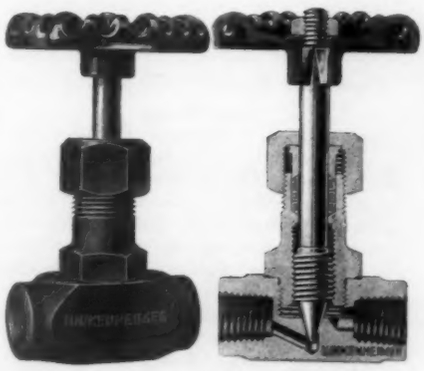


Fig. 1728 *Fig. 1730*

The valves are identical in design, with steel body, hub, stem, stuffing box nut and gland. Fig. 1728 has bar steel body and is Parkerized. Fig. 1730 is made of stainless steel and is intended for use in localities where corrosive fumes are present in the atmosphere. Both patterns are made in ⅛, ¼, ⅜ and ½ inch sizes.

A copy of booklet F-548 illustrating these valves will be sent upon request.

Defrosting Cocks

The Roberts Brass Mfg. Co., Detroit, Mich., are introducing the Roberts Defrosting Cock for use on gas fired refrigerators, which enables defrosting of the unit without extinguishing the flame. By turning the handle indicator to the defrosting position the flame is lowered but not turned out. When the defrosting

operation is complete, turn indicator handle back to "on" position and the flame returns to normal. The gas can be turned off completely if desired.

Folders on New Aluminum Coating

Aluminum Industries, Inc., Cincinnati, Ohio, have issued two folders describing Permite Resalum, a new aluminum coating, and its uses.

NEWS of the GAS INDUSTRY

Gas Sales of The Peoples Gas Light and Coke Company

The Annual Report of The Peoples Gas Light and Coke Company and Subsidiary Corporations, for the fiscal year ended December 31, 1931, shows total gas sales by the Company during the year of 215,133,032 therms. This is a decrease of 5.26 per cent as compared with 1930. The effect of the general business situation was reflected in a reduction in sales of all classes. Temperature conditions, which have an influence on gas sales, were also adverse. The temperature excess above normal for the year averaged 4.8 degrees per day.

A new maximum one-hour send-out was established between 11.00 o'clock A. M. and 12.00 o'clock noon on Thanksgiving Day, November 26, when 88,008 therms were distributed. This represents an increase of 3.17 per cent over the previous maximum one-hour send-out of 85,304 therms.

New Extension, To Cost About $54,000, Will Be Ready in Spring

Plans for the extension of its gas mains to Allentown at an expenditure of over $54,000 have been completed by Public Service Electric and Gas Company, Newark, N. J. Materials have been ordered and as soon as they arrive, work will be started so that gas will be available in the Spring.

Connecting with the Public Service gas distribution system at Allentown Road, Yardville, the new extension will necessitate the laying of 31,200 feet of pipe, ranging in size from two to six inches. It is estimated there will be approximately 300 customers for the new service.

Public Service Company of Indiana Effects Merger

Merger of the Indiana Electric Corporation into the Public Service Company of Indiana has been consummated, according to a recent announcement by Robert M. Feustel, president of Midland United Company, which controlled both companies.

The merger is in line with the Midland United Company's policy of simplifying the corporate structure of subsidiaries by merging companies into larger and stronger units.

Combined annual operating revenue of the two companies during 1931 amounted to approximately $15,000,000.

As a result of the merger, the Public Service Company of Indiana will now serve 275 communities in central and southern Indiana, including Terre Haute, New Albany, Jeffersonville, Vincennes, New Castle, Columbus, Franklin, Shelbyville, Connersville, Lafayette, Bedford, Bloomington, French Lick and West Baden with electricity or gas or both.

Approve Exercise of Franchise

The New York Public Service Commission has approved the exercise of a franchise granted to the Keystone Gas Company, Inc., for the furnishing of gas in the village of Millport, Chemung County, and has also consented to the transfer of a franchise granted by the village of Millport to the Consumers Natural Gas Company to the Keystone Gas Company.

The Home Gas Company has a transmission line which conveys natural gas from recently opened wells in Schuyler County. This transmission line passes near Millport and it will be necessary to construct about 10,000 feet of main to carry gas from the transmission line to the village. It is estimated that this will cost about $7,087.

It was stated that the company will begin the construction work early next spring. The Keystone Company owns a number of wells near Watkins and purchases gas from the Home Gas Company.

Optional Rates Authorized for San Diego

Tentative rate schedules, one based on natural and one on manufactured gas, have been authorized for the San Diego (Calif.) Consolidated Gas and Electric Company under the orders of the State Railroad Commission. These two rate schedules, which are optional with the company, were made effective March 1 subject to amendment after further investigation by the Commission. Under the present status the local company can therefore choose whether it prefers to supply manufactured or natural gas.

Authority Granted to Construct Gas Line

The New York Public Service Commission has approved the exercise of franchises granted to the Peoples Gas & Electric Company of Oswego, the Syracuse Lighting Company and the Fulton Fuel & Light Company for the furnishing of gas in the towns of Scriba, Minetto, Schroeppel, Phoenix, Granby and Volney, Oswego County, and the towns of VanBuren and Lysander, Onondaga County.

It is proposed to construct a transmission pipe line from Syracuse through Baldwinsville, Fulton and other municipalities to Oswego, including certain territory now served by the Syracuse Lighting Company, the Baldwinsville Light & Heat Company, the Fulton Fuel & Light Company and the Peoples Gas & Electric Company of Oswego, all of which are subsidiaries of the Niagara Hudson Power Corporation.

Reduction in Gas Rates Planned

New gas rate schedules are being prepared by the Northern Indiana Public Service Company which will mean a saving of $160,000 annually to residential and commercial users in Hammond, East Chicago and Whiting, Ind. The schedules will be filed with the Indiana public service commission. Officials said they would be in line with recent reductions in gas rates made in the Calumet district.

Convention Calendar

March

30 New Jersey Gas Association, Newark, N. J. Herbert E. Cliff, secretary.

April

8 Maryland Utilities Association annual convention, Lord Baltimore Hotel, Baltimore, Md. D. E. Kinnear, secretary.

6-8 A.G.A. Distribution Conference, Tutweiler Hotel, Birmingham, Ala.

11-13 Mid-West Gas Association, St. Paul, Minn.

13-15 Arizona Utilities Assn., Tucson, Ariz.

26-28 Pennsylvania Gas Association, Galen Hall, Wernersville, Pa.

28-30 Missouri Association of Public Utilities, Excelsior Springs, Mo. F. D. Beardslee, secretary.

May

3-5 Southern Gas Association, New Orleans, La.

9-11 Natural Gas Convention, Mayo Hotel, Tulsa, Oklahoma.

June

9-10 Canadian Gas Association, Winnipeg, Manitoba, Fort Gary Hotel. G. W. Allen, secretary.

July

5-7 Michigan Gas Association, annual convention, Mackinac Island, Mich. Albert G. Schroeder, secretary-treasurer.

August

23-26 Pacific Coast Gas Association, Davenport Hotel, Spokane, Wash.

October

10-14 American Gas Association, Atlantic City, N. J.

A. G. A. Supporting Harry C. Abell for U. S. Chamber of Commerce

Harry Clinton Abell of New Orleans, Louisiana, has been enthusiastically endorsed by the American Gas Association for re-election to the DIRECTORATE, CHAMBER OF COMMERCE of the UNITED STATES of AMERICA to represent the Natural Resources Production Department.

In addition to the wholehearted approval of President R. W. Gallagher, and the Executive Board of the American Gas Association, Mr. Abell's candidacy for re-election has also received the endorsement of J. F. Owens, president of the National Electric Light Association, as well as that of Mr. Guy A. Richardson, president of the American Electric Railway Association. Some forty-odd additional endorsements from various associations and chambers of commerce have also been received.

Mr. Abell has been a member of the Board of Directors of the United States Chamber of Commerce for the past two years, representing the Natural Resources Production Department. The exceptionally constructive manner in which he has fulfilled this position, together with his wide business experience and connections unquestionably merits his continuance as a Director of the Chamber. Mr. Abell is a convincing speaker. He is nationally minded and his training and experience admirably qualifies him for the specialized duties of the Natural Resources Production Department.

In addition to two years experience as a director, Mr. Abell has served as a National Councillor in the Chamber. His business connections are many, and include among others: Vice-President of the Electric Bond & Share Company, Vice-President and Director of the Electric Power & Light Corporation, President of the National Power & Light Company, Vice-President of the New Orleans Public Service, Inc., Chairman of the Board and Director of the Memphis Power & Light Company, Chairman of the Board and Director of the Memphis Street Railway Company, Chairman of the Board and Director of the West Tennessee Power & Light Company, and a Director in many other companies.

For a number of years Mr. Abell has been an outstanding figure in the affairs of the American Gas Association and his efforts have contributed immeasurably toward the advancement of the gas industry.

Ordinarily, the election of the Directors of the Chamber of Commerce of the United States is highly competitive. In order to assure Mr. Abell's re-election, it is essential that the endorsement of many of the National Councillors representing organization memberships in the Chamber be secured.

All public utility executives are urged to secure Mr. Abell's endorsement from the National Councillors representing Trade Associations and local Chambers

Harry C. Abell

of Commerce with which they have affiliations. It is suggested that these commitments be secured at once, as they will be decidedly more effective now than if secured later.

The annual meeting of the Chamber of Commerce of the United States will be held in San Francisco beginning May 18, 1932.

The American Gas Association headquarters, No. 420 Lexington Avenue, New York City, will appreciate being advised of any endorsements secured for Mr. Abell's re-election.

Henry L. Doherty & Company Open West Coast Securities Offices

Henry L. Doherty & Company announce the formation of a Pacific Coast Division of Securities Sales offices with headquarters at San Francisco and branch offices in Los Angeles and Seattle. Bonar Russell, associated with leading banking and securities sales organizations on the West Coast for the past 20 years, has been appointed Pacific Coast Division Manager.

Mr. Russell announces the appointment of Dean L. Weaver as manager of the Los Angeles branch and of Duncan Matthews, manager of the Seattle branch. The Henry L. Doherty & Company's Securities Department is divided into three groups: The Pacific Coast, just formed, with headquarters at San Francisco, the Mid-Western Division with headquarters at Kansas City, and the Eastern Division with headquarters at New York.

Consolidated of New York's Quarter Century Club Holds Annual Dinner

More than 1400 persons attended the eighth annual dinner of the Quarter Century Club of the Consolidated Gas Company of New York and its affiliated companies at the Waldorf-Astoria Hotel Monday, Feb. 8. George B. Cortelyou, President of the company, presided, and other officials were present and took part in the program.

A total of 403 new members were admitted to the Quarter Century Club, the membership of which is limited to those who have completed twenty-five years or more of continuous service with the companies. This dinner was the first at which employees of the affiliated electric and steam companies were present.

Two hundred and six medals and citations for acts of conspicuous bravery and for saving human life were presented during the evening.

Honor was also paid to a group of five men when Floyd L. Carlisle, Chairman of the Board of The New York Edison Company, presented special emblems to those employees who have more than fifty years of continuous service to their credit. Those honored were: Frank W. Smith, President of the New York Edison Company; F. L. Lambrecht, Auditor of Disbursements, Consolidated Gas Company; Richard Shepard, Superintendent of Pavements and Permits, Consolidated Gas Company; Thomas Byrnes, Engineer, The Astoria Light Heat and Power Company; and Henry Franz, Secretary, United States Mineral Wool Company, a subsidiary of the New York Steam Corporation.

The Consolidated Gas Company Meritorious Service Awards, consisting of 12 silver medals, 113 bronze medals, and 40 honorable mention certificates, were presented by Frank W. Smith, the newly-elected President of the New York Edison Company. Forty-one McCarter Awards, made under the auspices of the American Gas Association for saving human life by the prone pressure method of resuscitation, were presented by Oscar H. Fogg, Vice-president of the Consolidated Gas Company. Colonel John Stilwell, Vice-president of the Consolidated Gas Company, personally presented the Quarter Century Club buttons to the 403 new members.

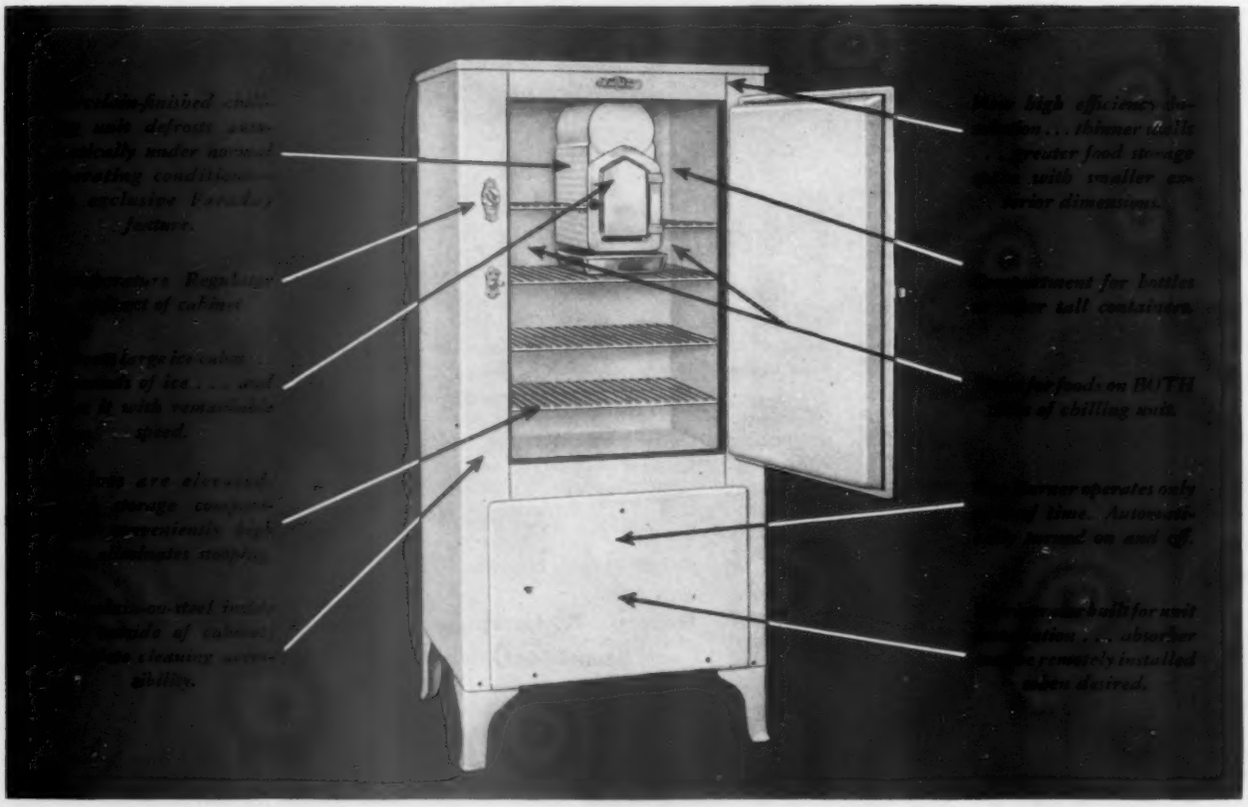
Bring in Gas Well

A gas well making about 2,000,000 cubic feet daily was brought in on the Dr. W. M. Dickie townsite, Paola, Kansas, recently. The gas is being purchased by the Union Pacific Service Company, a subsidiary of the Cities Service Company.

(News continued on page 54)

THE LATEST PRODUCT OF GENERAL MOTORS

THE Faraday



Permanent silence, low cost operation, long life, many exclusive features

Faraday Gas

A GENERAL MOTORS PRODUCT

GAS REFRIGERATOR

. . . a revolutionary new Gas Refrigerator marking a notable forward step in efficient, dependable refrigeration service

After many years of research, experiment and development, General Motors offers the new Faraday Gas Refrigerator as a new gas load building appliance to the Gas Industry of America. Here's a new and different refrigerator. It is distinctive because its operation is based on a practical application of the principle of refrigeration by absorption through use of a solid absorbent . . . discovered by Michael Faraday more than a century ago.

The principle of the Faraday Gas Refrigerator is a marvel of simplicity. Yet it establishes a new standard for efficient, dependable, and economical service in refrigeration . . . a logical result of its many new and advanced features in design and construction. Some of these important improvements are indicated in the illustration on the opposite page. There are many more.

The Faraday Gas Refrigerator is a product of General Motors Corporation, one of the world's largest manufacturers of fine mechanical products. This in itself is an important consideration. It is now being manufactured in limited quantities and distributed through Gas Utility organizations. Its distribution will be extended just as rapidly as the capacity of the factory is increased.

In the meantime, we invite you to write us for facts about the Faraday Gas Refrigerator—for details of plans for its distribution—for an outline of how we are prepared to cooperate with Gas Utility organizations in the way of advertising, sales helps, and business building service.

Refrigerators

FARADAY REFRIGERATOR CORP., DAYTON, OHIO

U. S. Supreme Court Rules On State Authority

A state public service commission may exercise greater than normal authority over interstate supply of natural gas if there be a close corporate relationship between the interstate enterprise and the local distributing company. This is clearly the significance of the decision on February 29 of the U. S. Supreme Court, in the case of the Kansas Public Service Commission vs. certain subsidiaries of the Cities Service Company. In this case the Federal Supreme Court was asked to rule on the validity of orders from state authorities which demanded information regarding the basis on which a local distributing company was charged a certain price at the city limits by the pipe line company. The lower court had ruled that the State Commission had the right to question this prevailing rate of 40 cents per M. The Supreme Court supports this view. One of the most significant parts of the opinion delivered by Mr. Justice Roberts and concurred in by all of the Court is the following paragraph.

Having in mind the affiliation of buyer and seller and the unity of control thus engendered, we think the position of the appellees is sound, and that the court below was right in holding that if appellant desired an increase of rates it was bound to offer satisfactory evidence with respect to all the costs which entered into the ascertainment of a reasonable rate. Those in control of the situation have combined the interstate carriage of the commodity with its local distribution in what is in practical effect one organization. There is an absence of arms' length bargaining between the two corporate entities involved, and of all the elements which ordinarily go to fix market value. The opportunity exists for one member of the combination to charge the other an unreasonable rate for the gas furnished and thus to make such unfair charge in part the basis of the retail rate. The State authority whose powers are invoked to fix a reasonable rate is certainly entitled to be informed whether advantage had been taken of the situation to put an unreasonable burden upon the distributing company, and the mere fact that the charge is made for an interstate service does not constrain the Commission to desist from all inquiry as to its fairness.

Oklahoma to Lower Gas Rates

Decidedly lower gas rates are forecast by Chairman Paul A. Walker of the Corporation Commission of Oklahoma, following a series of hearings regarding rates charged by the Lone Star Gas Co. in 26 cities of that state. The present average rate to the customers is said by the Chairman to be 75 cents per M, with the rate at the point of delivery by pipe lines to the city gate of 40 cents per M. The Chairman forecasts the two rates will be made 62 cents and 28 cents respectively. This is the group of companies against which Governor Murray sought recently to enforce an ouster suit on the ground that it was violating anti-trust laws of the state. The ouster suit was dismissed in the courts recently.

New Jersey Gas Association Plans Fine Program

The New Jersey Gas Association will hold its annual convention on Wednesday, March 30, at the Public Service Auditorium, Newark, New Jersey.

The morning session of this one day meeting will include addresses by Louis Stoecker, president of the Association, and Alexander Forward, managing director of the American Gas Association. This will be followed by an address on customers service by a nationally known leader in this field. Harry Ellis, of Public Service Electric and Gas Company, will then describe an interesting engineering project in connection with the laying of a submarine cable. The morning session will be concluded with an address on home service work by Mrs. A. Mixter of the Hartford Gas Company.

During the afternoon session E. D. Milener, secretary of the American Gas Association Committee on Industrial Gas Research, will discuss some of the recent activities of his committee. H. P. Morehouse, chairman of the New Jersey Gas Association Industrial and House Heating Committee, will describe a new pocket manual prepared by his committee for house heating engineers. C. E. Bartlett, president of the Bartlett Company, Philadelphia, Pa., will present an address on merchandising water heaters. A paper on a technical subject yet to be selected will then be presented, followed by a presentation by Dr. W. T. Reed dean of Rutgers University, who will summarize the gas research work done at the University during the year under the auspices of the Association's research fellowship.

Recognition Granted Gas Company in Indiana

The Indiana public service commission has issued an order establishing the Indiana Gas Distribution Corporation, a subsidiary of the Columbia Gas & Electric Corporation, as a public utility in Indiana.

The company owns a pipe line from the Illinois state line to near Muncie and proposes to operate in Vermilion, Parke, Putnam, Hendricks and Boone counties according to its petition asking for recognition.

Granting of the petition places the company in a position to provide a natural gas supply to communities through which the pipe line runs.

The Columbia Gas organization has agreed not to operate within Marion county, which is virtually Indianapolis, without first obtaining consent of the city utility district trustees, the board of public works and the county commissioners.

Earnings of United Gas Improvement Co.

The United Gas Improvement Company in a comparative income statement for the years 1930 and 1931, shows total income from dividends, interest and miscellaneous sources for the year 1931 of $37,914,976.65, an increase of 4.7% over the previous year. After providing for expenses, interest and taxes, net income available for dividends amounted to $34,750,115.39, an increase of 5.9%. Dividends paid on the $5.00 dividend preferred stock were $3,749,366.92, and on the common stock $27,905,308.80, or $1.20 per share, leaving a balance transferred to surplus of $3,095,439.67. Earned surplus December 31, 1931, amounted to $68,585,160.87.

Mr. John E. Zimmermann, president of the company, points out that the statement is an income statement and therefore does not include the company's proportionate interest in undistributed earnings of subsidiary companies, but that such earnings will be reflected in the combined earnings statement of The United Gas Improvement Company and subsidiary companies to be included in the annual report, which will be mailed to stockholders about April 1, 1932.

Chicago Chemical Center

The first step in the establishment of a great chemical center in Chicago was taken January 30, when officers of the Chicago Section of the American Chemical Society signed a 5-year renewal lease for facilities in the Midland Building, one of Chicago's modern office structures, 22 stories high, centrally located.

This lease gives members of the Chicago Section of the American Chemical Society the use of the Midland Club quarters for meetings.

At the same time the members of the Chicago Chemists Club took over club quarters on one floor of the building.

The Chemists Club lease gives members the right to use the Midland Club facilities at all times, as well as their own. The Chemists Club will be able to furnish regular club accommodations, including dining service and sleeping quarters.

Several chemical companies now have their Chicago quarters in the building and efforts are being made to rent space to other companies allied with the chemical industries, inasmuch as the chemical atmosphere prevailing makes the building particularly suitable for such tenants. Change of name of the building to "The Chemical Center" is contemplated.

Declare Dividend

The Board of Directors of the West Ohio Gas Company has declared the regular quarterly dividend of one and three quarters per cent on the outstanding Preferred Stock of the Company, payable March 1, 1932, to stockholders of record February 15, 1932.

New York Official Comment On Appliance Selling

The selling of appliances by a public utility company may be important as a service to the patrons. This conclusion is clearly recognized in a report released during February by the Public Service Commission of New York State. The generalization is, however, qualified by several important comments by Chairman Milo R. Maltbie whose summary is the basis of the commission action.

Separate bills for appliances should be rendered, or for any other service than the gas or electric. This conclusion is reached because Chairman Maltbie also concludes that a public utility company has no right to discontinue service because merchandise bills are not paid, although it may have the right to exercise such privilege when bills for gas or electric service remain unpaid beyond authorized periods. Beyond these general conclusions, which apparently are accepted by the commission, it is clear that it is not the intent of this supervisory body to inject further orders at the present time. The trend of their thought and the probability as to later findings can, however, be inferred from the following portions of the statement which was released.

After reviewing several court opinions on the subject, Chairman Maltbie's report states: "While in no way holding that this Commission has judicial power to determine whether any certain corporation is empowered under its charter to deal in appliances, yet for the purpose of this proceeding it must, under the decisions, be held that gas corporations, electric corporations or gas and electric corporations are authorized to deal in both gas and electric equipment when such a business is reasonably carried on for the purpose of promoting the use of gas or electricity."

"The record shows, in some instances," says the report, "that utilities have withdrawn from the merchandising business where private agencies were performing every service that was required; and in other instances arrangements have been made between the utilities and the dealers for full cooperation, resulting in a minimum amount of work to be done by the utilities."

In a discussion of the accounting methods to be followed by utilities in conducting a merchandise business the report says: "It may be that the accounting system now in force does not produce or call for sufficient details to obtain an accurate financial statement; but if it is not possible to secure one or devise a system of accounting which will produce it, a serious question arises as to whether utilities should be allowed to conduct a business which is not necessary to the supply of gas and electricity and for which the profits or losses therefrom can not be determined.

"If the business were conducted by a separate corporation as in the case of at least one company under the jurisdiction of this Commission, the profits or losses would be shown; and it may be desirable that all merchandising business should be conducted if in no other way can true costs be determined.

"However, it does not seem reasonable at this stage to assume that a true financial statement can not be obtained from utilities who do a merchandising business; and until further efforts have been made in this direction and failure is found to be unavoidable it seems unnecessary to discuss what course should be followed when, if ever, it develops that only by the institution of a separate corporation will it be possible to secure a full and complete statement of revenues and expenses for utility merchandising.

"Until more definite information is available and the facts established, such as would be provided by a proper accounting system, I recommend that no ruling be made as to the disposition of the profit or loss," continues Chairman Maltbie's opinion. "There is one point, however, which is reasonably clear, namely, that the losses should not be capitalized and, conversely, that there is no basis for deducting profits from capitalization."

It is pointed out that it has been the practice of many utilities to include in their bills for gas and electricity amounts due the company for appliances or wiring service and that the Commission has received complaints that in some instances corporations have threatened to discontinue service unless payments for appliances were made.

"A public service corporation has no right to discontinue service because merchandising bills are not paid," says the report. "Its authority in this direction is strictly limited and neglect to pay installments due on apparatus for appliances delivered is no ground for disconnection of service."

Cities Service Monthly Earnings Continue Increase Started Last June

Cities Service Company in December again showed a substantial increase in earnings over the previous month. Since June, the company's monthly earnings have steadily gained, and net to common stock and reserves for December was 44% higher than for November, and an increase of 293% over June.

In the thirty days ended January 15, 1932, the number of holders of Cities Service Company Common stock increased 5,925, bringing the total to 518,299, a gain of more than 79,000 for 1931.

In December, Cities Service Company's public utility subsidiaries showed an increase in both gross and net earnings over November. Net earnings for the calendar year of 1931 were within 4.3% of those for 1930, which was the banner year for the Cities Service organization.

Gas Utility Revenues Down 5 Per cent in 1931

Revenues of manufactured and natural gas utilities aggregated $649,019,772 during 1931, as compared with $682,353,203 during the preceding year, a decline of 5 per cent, according to reports from companies representing nearly 90 per cent of the utility distribution of manufactured and natural gas, it was announced recently by Paul Ryan, Chief Statistician of the American Gas Association.

The manufactured gas companies reported revenues of $373,225,622 for the year, a drop of 2.8 per cent from a year ago, while revenues of the natural gas concerns totaled $275,794,150 or approximately 8 per cent less than for the year 1930.

Sales of manufactured gas reported for 1931 totaled 349,146,454,000 cubic feet, a decline of 2.6 per cent, while natural gas sales for the year were 678,433,837,000 cubic feet, a drop of 9 per cent. Natural gas sales for industrial purposes declined from 230,830,346,000 cubic feet in 1930 to 202,957,869,000 cubic feet in 1931 a drop of approximately 12 per cent.

For comparison with other fuels, the production of bituminous coal during 1931 declined by nearly 18 per cent from the preceding year, anthracite coal production dropped more than 15 per cent, crude petroleum output was down 5 per cent, coke production down nearly 30 per cent, while the production of electric power declined by 4 per cent.

These economic adjustments characterizing most of the basic fuel industries were reflected in the production policies of the manufactured gas companies during 1931. The declining trend in the production of water gas continued, output averaging more than 8 per cent under the previous year. While the quantities of coke oven gas produced in plants owned by gas utilities increased by nearly 8 per cent, rising from 48,640,015,000 cubic feet in 1930 to 52,312,827,000 cubic feet in 1931, the volume of coke oven gas purchased from sources outside the industry, such as merchant coke and steel companies, fell from 111,068,992,000 cubic feet in 1930 to 102,773,607,000 cubic feet in 1931, a decline of 7.5 per cent.

A significant feature of natural gas utilization is indicated by the fact that while the total production of electric power during 1931 declined by 4 per cent from the previous year, the use of natural gas for the generation of electric power revealed a marked increase. Consumption of all other fuels by the electric industry decreased considerably during the year, and the production of hydroelectric energy dropped 7 per cent, but the use of natural gas by electric utilities during 1931 increased 15 per cent as compared with the previous year.

Answer to Starbuck Rebus:—"High pressure selling is on its last legs."

Proposal for Standard Manhole Frames and Covers

A proposal for an American Standard for manhole frames and covers containtaining recommendations for 13 types of frames and seven types of covers to replace the thousands of types now in use has just been published by the American Standards Association, 29 West 39th St., New York. The demand for innumerable, different designs and sizes of openings for manholes by the various public utilities and municipal supply departments which make use of manholes for their underground pipes and lines has caused many difficulties in manufacture and replacement of manhole frames and covers. The present concerted effort to standardize on a few sizes and styles is the result of these difficulties. Since 1924 a technical committee has been working on the subject under the procedure of the American Standards Association, going through a long process of elimination, selection, and re-design.

The committee, of which American Gas Association is a member, is now circulating a questionnaire to all those concerned with the production and use of manhole frames and covers to determine whether producers and users find the recommendations satisfactory or whether they wish to make suggestions for changes.

The proposed standard includes drawings showing designs and dimensions for the 13 types of manhole frames and the seven types of manhole covers which are recommended. It is believed that this limited number of frames and covers will meet the present requirements of the various utilities concerned.

The draft also includes specifications for hydrant and service valve boxes. Specifications are given for the gray-iron and carbon-steel castings to be used in the manufacture of manhole frames, covers, and boxes. Standard methods of test are provided by which both manufacturers and purchasers can determine compliance with the specifications.

Take Over Gas Company

The United Companies of Abilene, Kansas, a holding concern for public utilities operating in Kansas, Missouri, Oklahoma, Nebraska, Indiana, Ohio, Pennsylvania, have taken over the Colorado Gas & Utilities Company of Lamar, Colorado, owners of gas wells in Stevens county, Kansas, and serving Lamar and many cities with natural gas. H. L. Salter is the Lamar manager. The officers of the United are C. L. Brown, president; L. O. Verckler, executive vice president ; W. S. Morrison, operating vice president; H. R. Rhorer, secretary-treasurer.

Contract for Natural Gas

The Ohio Oil Company was given the contract to serve Craig, Colorado, with natural gas, saying that it could get the gas from the Craig structure nearby and its first test well came in when only 1,700 feet deep, yielding 68 million cubic feet of gas daily.

Bureau of Standards Publications of Interest to the Gas Man

Copies of the following publications of the Bureau of Standards may be obtained, at the prices indicated, from the *Superintendent of Documents, Government Printing Office, Washington, D. C.*

Orders should be sent direct to the Superintendent of Documents and not to the Bureau of Standards. Remittances should be included with the order in the form of cash, postal money order, or coupons sold by the Superintendent of Documents in sheets of 20 for $1. Stamps are not acceptable.

Order by number only, thus RP348.

RP350. Thermomagnetic Investigation of Tempering of Quenched 0.75 Per Cent Carbon Steel.....G. A. Ellinger

This paper describes a study of the tempering of a water-quenched 0.75 per cent carbon steel, thermomagnetic analysis being used as a method for revealing magnetic changes in this material upon heating to, and holding constant at, certain selected temperatures. The progress of the decomposition of the various constituents of hardened steel, as well as the condition of the carbon in the original constituents and their decomposition products, was followed by means of these magnetic changes. 11 pp. Price, 10 cents.

RP354. The Passage of Gas Through the Walls of Pyrometer Protection Tubes at High Temperatures
William F. Roeser

After a brief discussion of the contamination of thermocouples resulting from the use of tubes which are not gas-tight, the results of the measurements of the rate of passage of air through 36 tubes of refractory porcelain (11 different classes), 2 of fused silica, 1 of pyrex glass, 2 of alundum, and 15 of metal are given for various temperatures which the tubes would withstand without noticeable deformation. Methods of testing are described, and a very brief discussion given of the processes by which air may pass through the tube walls. The results also indicate the degree by vacuum obtainable in porcelain tubes at 1,400° C. The new type of refractory porcelain tubes was decidedly superior to the older types of porcelain tubes. Price, 5 cents.

RP357. Aqueous Solutions of Ethylene Glycol, Glycerine, and Sodium Silicate as Quenching Media for Steels
Thomas E. Hamill

This paper reports a study of the quenching characteristics of aqueous solutions of ethylene glycol, glycerine, and sodium silicate. Cooling curves were determined on small cylinders of high-carbon steel quenched in these solutions. The effect of temperature and of concentration was also studied. The characteristics of the cooling curves and a study of the hardnesses and structures produced indicate that certain sodium silicate solutions may be useful for obtaining cooling rates between those of water and of oil. The results obtained with ethylene glycol and glycerine indicate that their solutions do not give reproducible cooling curves and, therefore, may not be particularly useful as quenching media. 22 pp. Price, 15 cents.

RP359. Soil Corrosion Studies: Nonferrous Metals and Alloys, Metallic Coatings, and Specially Prepared Ferrous Pipes Removed in 1930
K. H. Logan

This paper presents the results of the examination of specimens of non-ferrous materials and metallic protective coatings removed from 45 soils after exposure from four to six years. Included in the test were specimens of copper and brass pipe, cast and forged brass fittings, galvanized pipe and sheet steel, lead sheet, lead coated pipe, and lead coated and galvanized bolts. Data on the rates of corrosion of steel pipe are also presented as a basis for comparison. The nonferrous metals tested were found to resist corrosion somewhat better than steel, but they were not unaffected by soil action. 21 pp. Price, 10 cents.

RP362. The Hydrolysis of Chestnut and Quebracho Tanned Leathers by Sulphuric Acid.....E. L. Wallace

Samples of leather tanned with chestnut and with quebracho extracts, to which sulphuric acid had been added, were hydrolyzed by heating with water at 60° C., for 18 hours and the total nitrogen in the solution determined. Similar samples of leather which had been aged were digested with water at room temperature (25° C.) and the total nitrogen in the solution determined. The degree of hydrolysis was found to be an approximate measure of the deterioration caused by sulphuric acid as determined by strength tests on new and aged samples of leather.

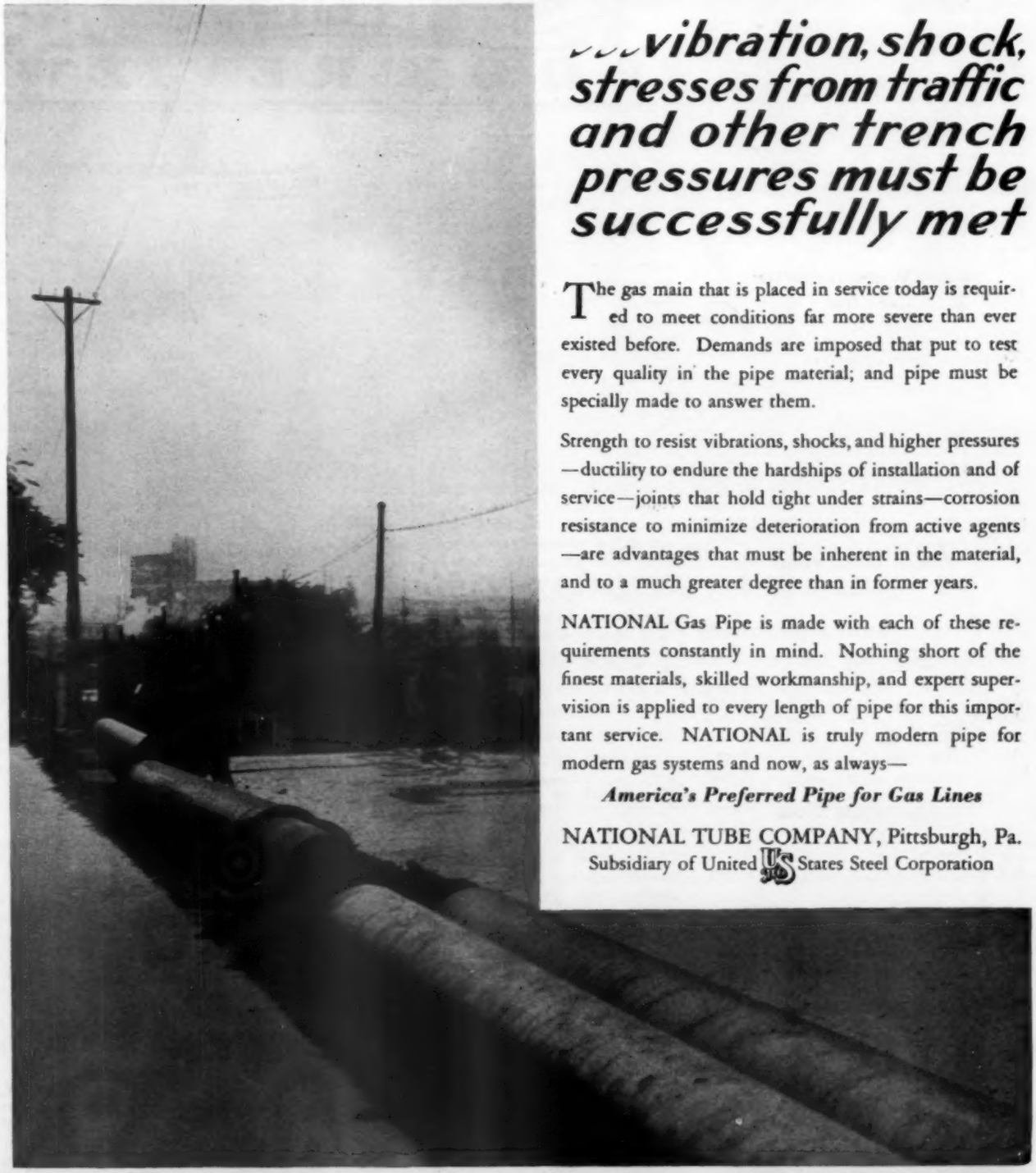
The results of the hydrolysis tests on both freshly prepared and aged leathers showed that quebracho-tanned leather was more resistant to deterioration by sulphuric acid than chestnut-tanned leather. 10 pp. Price, 5 cents.

RP363. Correlation of Certain Soil Characteristics with Pipe Line Corrosion.....I. A. Denison

Corrosion experienced in the operation of a group of pipe lines in Ohio was found to be related to the kinds of soil which occur along a 32-mile section of the lines. Corrosive areas were satisfactorily defined by comparing the percentage of pipe replaced in 1,000-foot intervals with values obtained from several laboratory tests carried out on samples of the soils. The tests employed were total acidity, pH in potassium chloride, and corrosion of a steel disk in moist soil. The methods employed may find application in locating corrosive areas in certain regions where acid soils occur. Further studies, however, are desirable in order to establish the application and limitations of the methods. 12 pp. Price, 5 cents.

(News continued on page 58)

MODERN GAS SYSTEMS NEED MODERN PIPE—



...vibration, shock, stresses from traffic and other trench pressures must be successfully met

The gas main that is placed in service today is required to meet conditions far more severe than ever existed before. Demands are imposed that put to test every quality in the pipe material; and pipe must be specially made to answer them.

Strength to resist vibrations, shocks, and higher pressures —ductility to endure the hardships of installation and of service—joints that hold tight under strains—corrosion resistance to minimize deterioration from active agents —are advantages that must be inherent in the material, and to a much greater degree than in former years.

NATIONAL Gas Pipe is made with each of these requirements constantly in mind. Nothing short of the finest materials, skilled workmanship, and expert supervision is applied to every length of pipe for this important service. NATIONAL is truly modern pipe for modern gas systems and now, as always—

America's Preferred Pipe for Gas Lines

NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

Proposed Valve Dimensions

The Center-to-Face dimensions for ferrous flanged valves recently developed and approved by the Manufacturers Standardization Society of the Valve and Fittings Industry as standard practice have been tentatively recommended for adoption as an American Standard by Subcommittee No. 5 of the Sectional Committee on the Standardization of Pipe Flanges and Fittings. This proposal sets forth the center-to-face dimensions of Cast Iron and Steel Flanged Valves of the wedge gate, globe and angle types, several pressures and over a considerable range of sizes. When adopted this standard should be of real value to industry as it will facilitate considerably the replacement of valves in existing piping systems.

A complete list of the valves included is as follows:

Flanged Wedge Gate Valves

Cast Iron

125 lb.	2 to 24 inch
250 lb.	2 to 24 inch

Steel

150 lb.	2 to 24 inch
300 lb.	2 to 12 inch
400 lb.	4 to 24 inch
600 lb.	1 to 24 inch
900 lb.	3 to 24 inch
1500 lb.	1 to 12 inch

Flanged Globe Valves

Cast Iron

250 lb.	2 to 6 inch

Steel

300 lb.	2 to 6 inch
400 lb.	4 to 8 inch
600 lb.	½ to 8 inch
900 lb.	3 to 8 inch
1500 lb.	1 to 8 inch

Flanged Angle Valves

Cast Iron

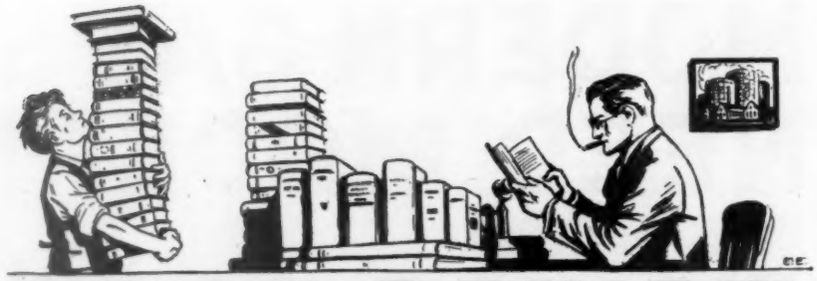
250 lb.	2 to 6 inch

Steel

300 lb.	2 to 6 inch
400 lb.	4 to 8 inch
600 lb.	½ to 8 inch
900 lb.	3 to 8 inch
1500 lb.	1 to 8 inch

This tentative proposal is now being distributed to a large number of interested firms and individuals for criticism and comment and after receipt of these comments the Subcommittee will formulate a definite recommendation for submittal to the Sectional Committee.

Requests for more detailed information concerning this proposal should be addressed to Mr. C. B. LePage, Assistant Secretary, ASME, 29 West 39th Street, New York, N. Y.



Proceedings Third International Conference on Bituminous Coal

Published by *Carnegie Institute of Technology*, Pittsburgh, Pa., 1932. Two volumes, 900 pages each, 6 x 9 inches, bound in full cloth, with numerous illustrations. Price $15, postage prepaid.

The two volumes of Proceedings of the Third International Conference on Bituminous Coal held in Pittsburgh, November, 1931, contain the complete text of all papers together with the many valuable and illuminating discussions. The formal written discussions prepared in advance are supplemented by contributions from the chairmen and delegates who are recognized authorities in their respective fields. The Coal Conference Proceedings are regarded throughout the world as standard reference books on fuel technology and should be of interest to many gas men.

Address all communications concerning the purchase of the Proceedings to L. J. Moore, Carnegie Institute of Technology, Pittsburgh, Pennsylvania, U. S. A.

The Effect of the Products of Combustion on The Shrinkage of Metal in the Brass Industry

Engineering Research Bulletin, Number 22, University of Michigan. *By C. Upthegrove and A. J. Hersig.* 66 pages—December, 1931. One dollar.

The investigation reported in this Bulletin covers studies made of the effect of the products of combustion and of fluxes on the shrinkage of metal in the melting of simple and complex brasses. The conditions of furnace atmosphere and temperatures and the composition of the metal were found to be the factors largely controlling the shrinkage.

Shrinkage in the melting operation occurs either by volatilization or by oxidation of the alloying constituents. In the first case, the loss is through the stack, while in the second, it is represented as dross or skimmings. Whether or not the loss is primarily by volatilization or by oxidation will be determined by the composition of the metal and by the nature of the furnace atmospheres. In the melting of metals in which volatilization losses predominate, a slightly oxidizing atmosphere may be used to provide protective crusts which will result in a lowering of the metal shrinkage. In the melting of metals in which the oxidizing losses predominate, the neutral or reducing atmospheres may be used to bring about the minimum shrinkage.

The use of fluxes as a means of lowering the metal shrinkage must be based on the same considerations as hold for the lowering of metal shrinkage by furnace-atmosphere control. A flux showing very satisfactory results in producing a lowering of the metal shrinkage is developed.

New Catalog on Republic Electric Weld Line Pipe and Casing

Republic Steel Corporation, Youngstown, Ohio, have just issued an attractive 36 page catalog, printed in three colors, on Republic Electric Weld Line Pipe and Casing. This book contains interesting information describing the painstaking care which goes into the progressive processes of making Republic Electric Weld Line Pipe and Casing. In addition, tables showing weight, diameter, wall thickness and mill test standards as well as information on threads and couplings are given. An authentic table of safe working pressures with various safety factors is also contained. Photographs illustrate the various processes.

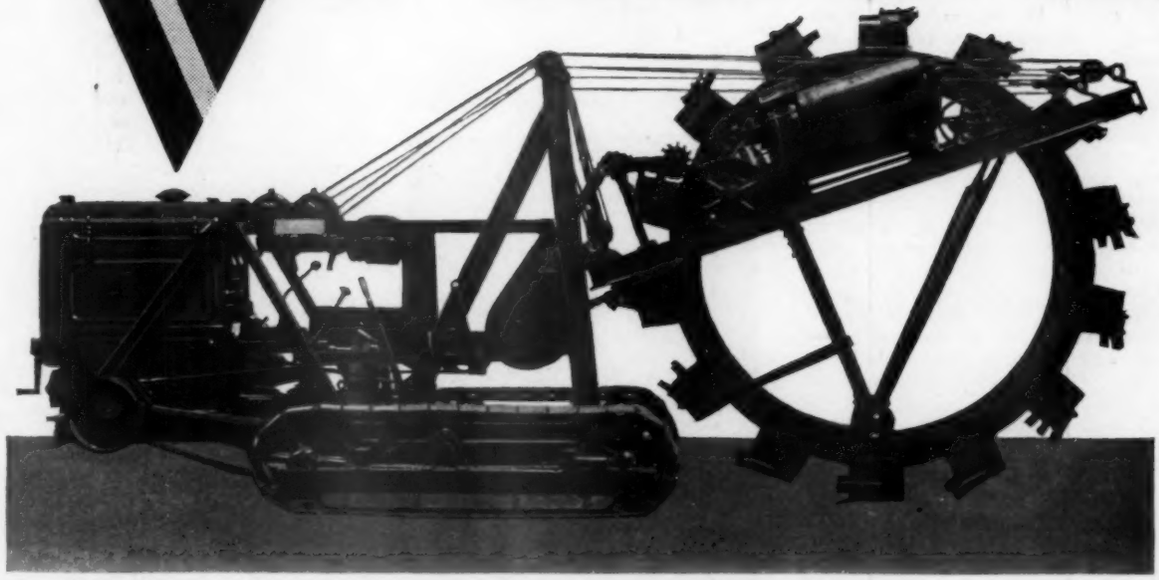
Copies of this catalog can be obtained from the Republic Steel Corporation when requests are made on business letterheads.

Booklet Issued by General Refractories Co.

The General Refractories Company, Philadelphia, Pa. has put into booklet form an article reprinted from the December issue of Mining and Metallurgy, entitled "New Developments in Unburned Magnesite Brick for the Metallurgical Industry." They point out that Ritex Magnesite Brick is the result of the developments outlined in the article.

Copies of this booklet can be obtained upon request.

VALUE



Never has machinery been subjected to such thorough investigation, such critical comparison of value, as today. Under this searching scrutiny the inherent value of the Cleveland Baby Digger is more apparent than ever before.

Your Investment will be Governed Primarily by

1. General Adaptability to Your Work

The Baby Digger: Is extremely small—only 57½ inches wide overall • Is extremely light—weighing but a little over 4 tons, with the weight concentrated close to the ground • Is quickly transported—on its special pneumatic tired trailer, complying with all city ordinances • Covers your entire digging range. Standard digging widths are from 10 to 23½ inches. Digs 5′ 6″ deep. (Intermediate width quickly secured by auxiliary cutters or by selection of any of 5 different bucket sizes) • Is simple and flexible in operation, having wide range of speeds and a minimum of operating levers. *Note*—The operator can see the digging action as well as all parts of the machine • Is powerful and fast. In every sense a real trencher, it admits no superior for ability to dig hard ground nor for speed of digging.

2. Cost of Operation

The Baby Digger: Is quality built. No tougher materials are obtainable than those assembled into this machine. *Completely* equipped with anti-friction bearings. All major drives are *enclosed and run in oil,* etc. • Shafts are special alloy steel, heat treated, turned and ground • Has unit-type construction. All units independent of each other, making them very accessible and preventing misalignment • Has wheel-type digging mechanism. Minimum moving parts and joints combined with rigidity and great strength. Has vibration-proof electric-welded frame and boom • Has very low fuel consumption. Savings on gasoline are surprising when considered over a year's time • Requires minimum of labor for right-of-way, moving and general operation.

Consider the Baby Digger from the viewpoint of an engineer, superintendent, foreman or operator, its practical value and economy for Gas Distribution Work is evident. You owe it to yourself to obtain complete details which are available without obligation.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 ST. CLAIR AVENUE .CLEVELAND, OHIO

The CLEVELAND BABY DIGGER

Personals

C. S. Bagg, General Manager of the Montreal Light Heat & Power Consolidated since early in 1929, was appointed Vice-President. Mr. Bagg has been identified with the Company in various executive and official capacities for the past 25 years. He will continue in the capacity of General Manager with the additional office of Vice-President.

W. H. Spencer, B. Sc., M. E., E. E., who has been acting as Assistant Secretary of Montreal Light Heat & Power Consolidated for some time, during which period he supervised accident prevention work, will now specialize in safety engineering. Mr. Spencer, who was formerly identified with the Electrical Engineering Division of the Company, is a graduate of McGill University in electrical and mechanical engineering and is particularly fitted by training and avocation to undertake this work.

C. C. Parkes was recently appointed Assistant Secretary of Montreal Light Heat & Power Consolidated. Mr. Parkes began his career with the Company in 1912 as a junior clerk. He served with the 5th Pioneer Battalion from 1915 to 1919 and enjoyed the distinction of being the youngest company sergeant-major in the Canadian forces, being at the time 18 years of age.

Upon his return in 1919 he was connected with the New Business Department and for the past year has been associated with the Executive Department.

Although a young man, Mr. Parkes has seen considerable service with the Company and the appointment has been accorded in recognition of experience and merit.

Bruno Rahn, chief engineer of the Milwaukee Gas Light Co., has been appointed general manager, according to an announcement made following the annual stockholders' meeting.

Officers re-elected were: President, R. B. Brown; vice president and secretary and treasurer, Ewald Haase; assistant secretary-treasurers, Louis T. Smith and Robert J. Johnson. All directors were re-elected. For the present Mr. Rahn retains his position of chief engineer.

Edward P. Gosling, vice-president and general manager of the Laclede Power & Light Co., succeeds George B. Evans as president of the Laclede Gas Light Co., St. Louis, Mo. Mr. Gosling was formerly vice-president and general manager of the Newport Electric Corp. of Newport, R. I.

H. H. Whiteside has been placed in charge of the newly established Builders Service Department of the Seattle Gas Company, Seattle, Washington.

Floyd L. Carlisle was elected Chairman of the Board of Trustees of the Consolidated Gas Company of New York at the organization meeting of trustees on February 25. He is the first man to hold this office since 1914, when the title lapsed with the resignation of the late Harrison E. Gawtry. Mr. Gawtry was the Company's first President, and the only other person to have held the rank of Chairman.

At the meeting, George B. Cortelyou was re-elected President for his twenty-fourth term. He will continue as the operating head of the Consolidated System.

Mr. Carlisle was elected a director of

Floyd L. Carlisle

the New York Edison Company, a Consolidated Gas Company subsidiary, on May 27, 1930; a trustee of the Consolidated Gas Company on May 29, 1930, and Chairman of the Edison Company's Board on February 18, 1931.

He is Chairman of the Niagara Hudson Power Corporation, which controls the Buffalo, Niagara and Eastern Power Corporation; the Frontier Corporation, and the Mohawk Hudson Power Corporation, which controls the New York Power and Light Corporation, Eastern New York Utilities Corporation, Syracuse Lighting Company, Utica Gas and Electric Company, and Cortland County Traction Company.

Born in Watertown, N. Y., on March 5, 1881, and graduated from Cornell University in 1903, Mr. Carlisle first became a lawyer, practicing in his brother's firm at Watertown; in 1910 he became a banker by carrying out a merger of two Watertown banks, and as a bank president became interested in water power, entering that field by heading a syndicate which secured control of the St. Regis Paper Company in 1916.

The paper business was advanced, but the increasing efforts toward the development of water power resulted in the formation of the Northeastern Power Corporation, in which the Carlisle holdings were consolidated in 1926.

Mr. Carlisle became a director of the National City Bank in April, 1930, and later was elected a director of the United Corporation.

Mr. Carlisle is also a director in more than twenty-five other public utility, financial, and paper organizations, as well as head of the firm of F. L. Carlisle & Co.

George Ostlund has been appointed General Sales Manager of the Consolidated Gas Company of New York. Mr. Ostlund, who for the past two years has served in the capacity of Assistant General Sales Manager, will report to N. T. Sellman, Assistant Secretary and Director of Sales and Utilization.

Mr. Ostlund is well-known throughout the gas industry, and has been actively associated with American Gas Association activities for some time. He has been Chairman of the Refrigeration Committee, and a member of the Managing Committee of the Commercial Section and other committees.

W. S. Walker has been appointed Engineer of Utilization of the Consolidated Gas Company of New York, and will report to N. T. Sellman, Assistant Secretary and Director of Sales and Utilization.

Exactly one year ago, he was appointed Assistant Engineer of Utilization, in charge of the Utilization Department, to succeed the late C. Y. McGown.

Mr. Walker graduated from the University of Virginia in 1926, with the degree of Mechanical Engineer. He joined the Consolidated Gas Company shortly after graduation, as a Cadet Engineer, and was assigned in turn to the Manufacturing, Distribution, Construction, and Utilization Departments.

He has several inventions to his credit, including a water strainer. and a gas filter that are used for the automatic gas refrigerator.

Alexander Gaddess, formerly director of public relations of the Pennsylvania Electric Association, has been appointed manager of publicity of the U. G. I. Public Relations Department.

C. E. Wetzel, who for several years has been in charge of publicity for U. G. I. and system companies outside of Philadelphia, will devote his time to advertising work for those companies, in addition to managing U. G. I. Circle.

Mr. Gaddess is a native of Baltimore and first entered newspaper work in that city as a member of the staff of the Baltimore American in 1916. After two years' service in the U. S. Navy during the war, he re-entered newspaper work and served on the staffs of several Philadelphia and New York journals.

For eight years prior to his connection with the Electric Association, begun in January, 1931, he was on the editorial staff of the *Evening Public Ledger.*

Frank E. Kistler, president of the Reiter-Foster Oil Company of Tulsa Okla., was elected chairman of the finance committee of the Oklahoma Natural Gas Corporation. Mr. Kistler is also president of the Frank E. Kistler Oil Company and the Diamond K. Mining Company.

(Personals continued on page 62)

HUMPHREY PRODUCTS

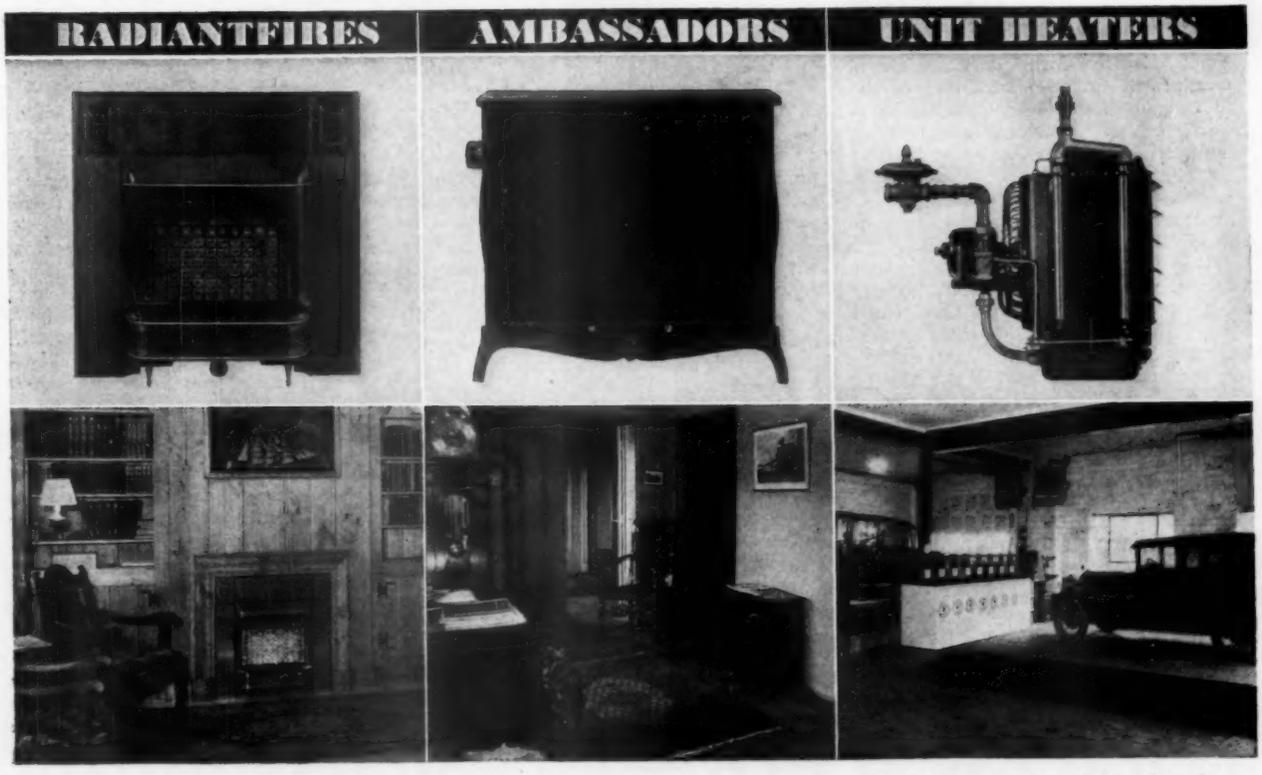


Photo Courtesy, Cities Service Oil Co., Kansas City

Step Up Your Gas Demand . .

Great heat producers, great load builders—these Humphrey Products are helping many utilities come out of the reconstruction period with good net profits.

RADIANTFIRES in their beautiful period designs and portable models bring instant sun-like warmth and comfort to homes and increase domestic load.

AMBASSADORS are in tune with the times with their forced air circulation. They find ready sale in homes, industrial offices, shops, and stores, opening new markets for gas sales.

GAS UNIT HEATERS are the greatest advance in unit heating for all industrial, commercial, and institutional uses. They build a new load that makes both old and new gas lines profitable.

When you install goods bearing the Humphrey mark, you have the satisfaction and security of knowing your customers will be as well pleased with their purchase as you are with your sale. Do you have complete information about each of these three types of Humphrey Products? If not, write today.

General Gas Light Company
Kalamazoo, Michigan

44 West Broadway
NEW YORK

135 Bluxome Street
SAN FRANCISCO

Bryan Dunlap has been appointed manager of the Valley Falls, Kansas, office of the Kansas Pipe Line & Gas Company. He was formerly located at Clay Center.

J. W. Woitkovich has been placed in charge of sales of the Stevens Point and Waupaca Districts of the Wisconsin Valley Electric Company.

H. S. Shevlin, formerly Chief Clerk, Germantown Commercial Office of the Philadelphia Gas Works Company, was transferred to the North Philadelphia Commercial Office as Assistant District Manager.

Samuel Insull, Jr., vice-chairman of the Midland United Co., was presented by the Chicago Junior Association of Commerce with a gold medal for the most meritorious civic service performed by a Chicagoan under 36 years of age during 1931. Mr. Insull, Jr., served during the year as president of the United Charities of Chicago, as vice-chairman of the governors' unemployment commission and as co-chairman of the Joint Emergency Relief fund which raised $10,000,000 for relief of the needy in Cook County, Illinois, the county in which Chicago is situated.

R. B. Ingle has been appointed manager of the Southern Cities Corporation branch in Key West, Fla., it has been announced, succeeding E. V. Malone, who recently resigned to enter other work.

Guy T. Henry has been appointed manager of the Athens, Ga., district, of the Southern Cities Corp., to succeed Norman Thomas, who has been transferred to Macon, Ga., as manager of that district, while A. F. Hall has been appointed superintendent of the Macon division of the company.

Charles Leech, formerly manager of the Macon division of the Southern Cities Corporation, has been promoted to the position of divisional engineer for the Eastern Division and will make his headquarters in Atlanta, Ga.

W. J. MacDaniels, Treasurer of the Northern Union Gas Company, was elected President of the Gas Companies' Employees' Mutual Aid Society at its annual meeting held recently. This organization is directly in charge of the employees welfare activities of the Consolidated Gas Company of New York and its affiliated gas companies.

H. L. Reden, Superintendent of Mains, was elected First Vice-president, and W. K. Newell Manager of the Payroll Department, was made Second Vice-president. W. G. Zepf, General Office Cashier, was re-elected Secretary and Assistant Secretary, respectively.

R. W. Petter, formerly of Dickinson, N. D., has been appointed manager of the Northwest States Utilities Co., at Conrad, Montana.

Walter E. Keefe has been appointed manager of the Pomona, Calif. district of the Southern Counties Gas Company. Mr. Keefe was manager of the Monrovia district for a number of years.

Homer Mead succeeds W. E. Keefe as manager of the Monrovia, Calif. district of the Southern Counties Gas Company.

L. D. Simmons has been named domestic sales manager for the Wasatch Gas Company and the Utah Gas & Coke Company, Salt Lake City, Utah. Mr. Simmons is also director of publicity and advertising for these two companies.

J. A. Ray has been named district manager of the Oklahoma Natural Gas Corporation, Tulsa, Okla. Mr. Ray succeeds Mr. W. H. Bagley, who has been transferred to the public relations department.

J. Phillips has been appointed manager of the Glasgow, Montana, District of the Bowdoin Utilities Company.

Obituary

W. D. KYSER

W. D. Kyser, President of the Memphis Power and Light Company, Memphis, Tenn., died suddenly at his home in Memphis on February 1st.

Mr. Kyser was born in Richmond, Alabama, July 17, 1882. Following his graduation from the University of Alabama he entered Lebanon University from which he was graduated with a law degree. Mr. Kyser was a leader at the Memphis Bar for many years and was associated with Senator K. D. McKellar. He became president of the Memphis Power and Light Company on July 15, 1930, succeeding T. H. Tutwiler.

BURROWS SLOAN

Burrows Sloan, Chairman of the Board of General Refractories Company, Philadelphia, Pa., and a business associate of the late Governor Sproul of Pennsylvania, died on February 28. He was in his 55th year.

Following his graduation from Princeton in 1899, Mr. Sloan was employed by the Reading Company and later became associated with the Harbison-Walker Refractories Company in Pittsburgh. In 1911, with Governor Sproul, he organized the General Refractories Company at Philadelphia. He became president of the company in June, 1925, and was named chairman of the board in April, 1931.

GILBERT ALBION BRAGG

Gilbert Albion Bragg, who was general manager of The Koppers Research Corporation, Pittsburgh, Pa., died on February 2, at his home, 6666 Woodwell Street, Pittsburgh, following an attack of influenza. He was a research chemical engineer who gained recognition first as an authority on hydrometallurgy and particularly on ore flotation and later as a specialist in gas purification.

Mr. Bragg was born at St. Joseph, Mo., in 1891, the son of Charles G. and Lida A. (Kelly) Bragg. He was educated at the University of Kansas, where he received the degree of B.S. in 1912, and was elected to membership in Alpha Chi Sigma and Sigma Xi. In 1925 he joined The Koppers Company of Pittsburgh, at its Seaboard plant, to engage in process development. A year later, in 1926, he was made head of the chemical engineering division of The Koppers Company in Pittsburgh, and in 1930 was appointed general manager of The Koppers Research Corporation.

Mr. Bragg was the inventor of processes for effecting the flotation of minerals, for recovering sulfur from its ores, and for purifying gases. These technical accomplishments, particularly his inventions of improvements in treating gases, made while he was in the Koppers organization, and also his contributions to the literature gave him high professional ranking in byproduct coke technology as well as in hydrometallurgy.

Mr. Bragg was married to Miss Elizabeth Perry Ayres, in 1919, at New Rochelle, N. Y. She and a son, Charles Gilbert Bragg, survive.

ANDREW J. CARSON

Andrew J. Carson, who held the record for length of service with the Consolidated Gas Company of New York, died on March 4 at St. Luke's Hospital, in his 82nd year.

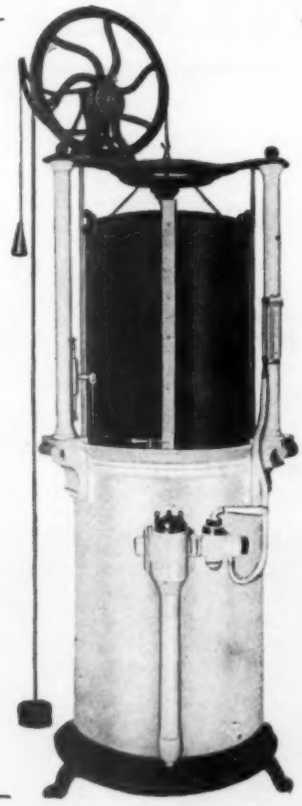
Mr. Carson would have completed sixty-two years of continuous service with the company this year, having joined the Mutual Gas Light Company on June 15, 1870, at the age of twenty. Prior to this he was associated with a plumbing firm, in installing gas meters. He remained with the Mutual Gas Light Company until it was absorbed by the Consolidated Gas Company on August 31, 1922, when he was transferred to the Distribution Department, as superintendent.

Mr. Carson was the sole survivor of the group of seven men, who in the early nineties founded the Gas Companies' Employees' Mutual Aid Society, the employee welfare organization.

Mr. Carson's record of employment with the Consolidated Gas Company was exceeded only by that of John O'Connell, who at the time of his death in 1928 had completed more than seventy-two years of active service with the company.

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs



SUPERIOR METER CO.
167-41st Street
Brooklyn, N. Y.

Multiple-lift GAS HOLDERS

McClintic-Marshall Low-Pressure, Multiple-Lift Gas Holders are well built from top to base. Fabrication is carried out under the direction of men of long experience in the largest plant in the world devoted entirely to steel-plate construction. McClintic-Marshall builds gas holders in a wide variety of sizes and types. Low-pressure, water-sealed holders of the multiple-lift type are built for any capacity. High-pressure holders, spheres and cylinders of either riveted or welded construction, are built for any working pressure.

McCLINTIC-MARSHALL CORPORATION
Subsidiary of Bethlehem Steel Corporation

General Offices: Bethlehem, Pa.

District Offices in New York, Boston, Philadelphia, Baltimore, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, San Francisco, Los Angeles

Export Distributor: Bethlehem Steel Export Corporation, New York City

McClintic-Marshall

TRADE NEWS

Collins Appointed Chaplin-Fulton Representative in Kansas City

Mr. C. H. Collins has been appointed representative for Chaplin-Fulton Manufacturing Company of Pittsburgh, Pa., manufacturers of gas regulators. Mr. Collins will look after the complete line of C-F regulators within his territory, and offices are located at 628 Dwight Building, Kansas City, Mo.

Barber-Greene Appoints Boehck Equipment Company New Representative

The Barber-Greene Company, Aurora, Illinois, manufacturers of Material Handling Machines, announce the appointment of the Boehck Equipment Company, a new organization with offices and warehouse at 2404 W. Clybourn Street, Milwaukee, Wis., to sell and service Barber-Greene machines in the state of Wisconsin.

J. F. Mehlhope Joins Chicago Steel Service Co.

Mr. J. F. Mehlhope, formerly Chicago district sales manager for Central Alloy Steel Corporation and later for Newton Steel Co., has joined the sales force of the Chicago Steel Service Co., warehouse distributors for Toncan Iron and Enduro Stainless Steels, products of Republic Steel Corporation.

The Chicago company has recently remodeled and enlarged its offices and warehouse facilities and is expanding its sales force. Mr. Mehlhope brings to his new connection a wealth of experience in the sale of special steel products.

Foxboro Issue Bulletin on Orifice Meters for Gas

In Foxboro's latest publication—Bulletin No. 176, entitled "Orifice Meters for Gas"—particular attention is called to the description of the Foxboro 20" Meter. It is claimed that this instrument makes it possible to meet the requirements of the A.G.A. for measuring gas at low static pressures without sacrificing ruggedness, dependability, accessibility or accuracy.

Among the other interesting features of this bulletin are a complete section on Construction Details of Foxboro Meters; a section describing the use of Foxboro Meters with 2½ and 8 pipe diameter connections; a description of the special use of the Meter with 0-10 square root charts; and a page describing other instruments used in gas measurement service.

Copies of this bulletin will be sent to Gas Measurement Engineers or to anyone interested in gas flow measurement.

Reynolds Regulator Co. Appoint Kansas City Representative

The Reynolds Gas Regulator Co. of Anderson, Ind., announces the appointment of G. Blanchard Smith as their sales representative in the Kansas City territory.

Mr. Smith's territory embraces the states of Kansas, Nebraska, Missouri, Colorado, Iowa.

G. Blanchard Smith

Mr. Smith was for several years connected with the sales force of Westcott and Greis, Inc., Tulsa, Okla. He is thoroughly familiar with regulator problems and their solution.

General Electric Co. Appoint C. E. Anderson Auditor of Disbursements

C. E. Anderson has been appointed auditor of disbursements in the accounting department of the General Electric Company to succeed the late F. D. Kamerer, it has been announced by S. L. Whitestone, comptroller of the company. Mr. Anderson entered the business training course of the General Electric Company immediately after his graduation from Bentley School of Accounting in 1924.

Booklet Gives New Specifications for Mono-Cast Pipe

An illustrated discussion of the Modified Fairchild Formula for determining metal thicknesses for cast iron pipe is a feature of a new booklet, "Specifications for Acipco Mono-Cast Centrifugal Cast Iron Pipe, Bell & Spigot, 1932," now being distributed gratis by The American Cast Iron Pipe Company, Birmingham, Alabama.

The new booklet is occasioned by the recently promulgated Federal Specifications for bell-and-spigot cast iron pipe in which certain revisions of former requirements are contained. Complimentary copies of the booklet may be obtained by writing direct to The American Cast Iron Pipe Company, Birmingham, Alabama, or to any of the company's branch offices.

Lindeweld Process Shown in Motion Pictures

The technique of the Lindeweld Process and its application in the construction of a 20-in. natural gas line are shown in full detail in a motion picture, "New Lindeweld Process for Pipe Line Construction," prepared and distributed by The Linde Air Products Company, 30 East 42nd Street, New York, N. Y.

The film comprises two reels, the first of which illustrates the technique of the Lindeweld Process. Remarkable close-up views show the action of the flame on the metal and the flow of the weld metal in even greater detail than is visible through welders' goggles. The second reel shows the application of the Lindeweld Process in the field in pipe line construction.

Like other Linde motion pictures, this new film is available for showing before Engineering and Technical Societies, Engineering Colleges, Trade and Vocational Schools, Foremen's Clubs, and other technical and industrial groups. Films are loaned free of charge and are available both in 16 mm. and 35 mm. sizes. Since they are of the safety, non-flammable type, they may be shown anywhere without restriction. Inquiries may be addressed to the nearest District Office of The Linde Air Products Company.

Correction

In the February issue of the AMERICAN GAS JOURNAL was a news story of the annual meeting and exhibit of the Heating and Ventilating Association held at Cleveland, Ohio, week of January 25th. In it was stated that the W. M. Chace Valve Company, Detroit, Mich. showed a complete line of valves. This was in error, for the W. M. Chace Valve Company manufacture "Chace Thermostatic Bimetal" which is offered in sheets, strips and formed parts, especially adapted for use in safety pilots and other gas appliance controls that must operate at red heat temperature.

Pave the way
for Spring Sales
with new ROBERTS ADVERTISING

Systematic advertising, coordinated with aggressive sales effort BRINGS RESULTS. Send your sales representatives out this spring with the assured backing of a sustained advertising campaign.

Write for our new sales literature. There are at least thirty-five new pieces of literature fresh off the press. Illustrated letters; four-page folders in full color; envelope stuffers to go with your monthly gas bills; blotters; newspaper advertisements, including a clever new comic strip series and a big eight-color window display for your window.

A broadside with complete samples of our advertising literature will be mailed to you on request. Write today.

It's Just Out!

ROBERTS-GORDON
APPLIANCE CORPORATION
CURTISS BLDG. BUFFALO, N. Y.

Trade Mark

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD
has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

PRECISION THERMOMETER & INSTRUMENT COMPANY

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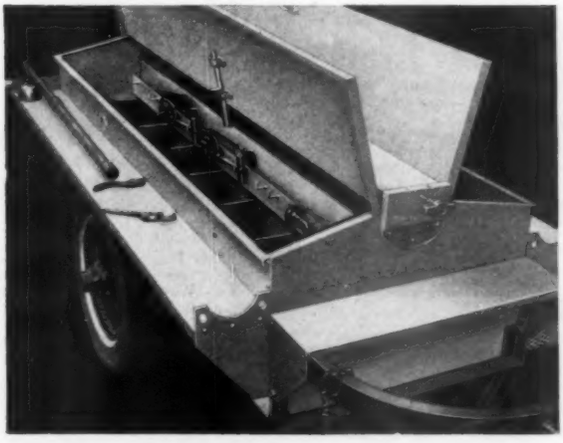

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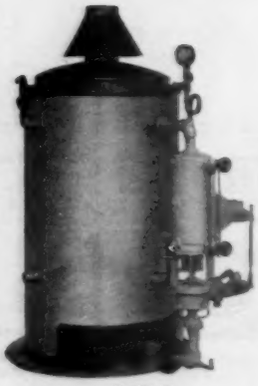

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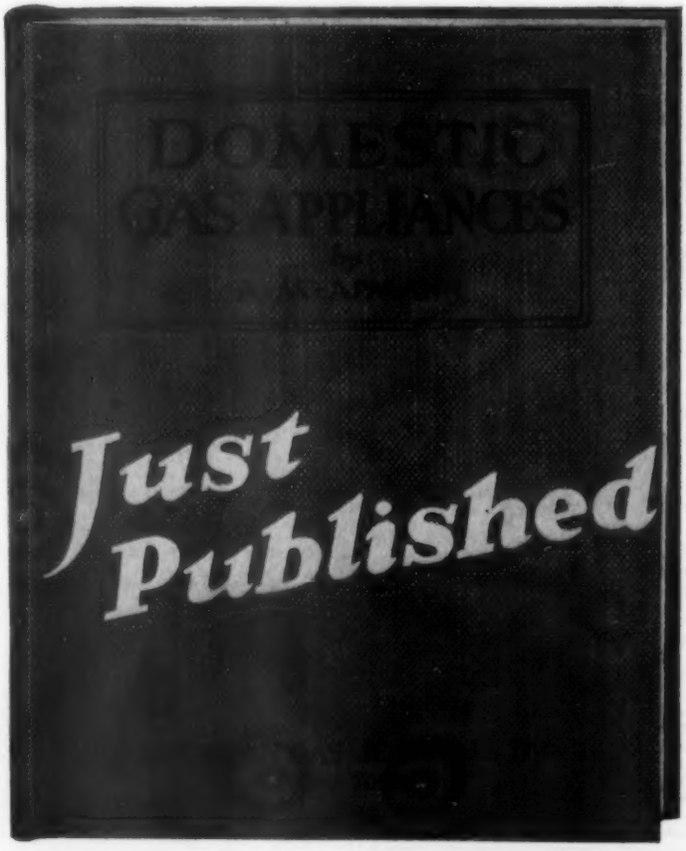

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VI. Appliance Installation
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X. Gas for Househeating
XI. The Househeating Furnace and Accessories
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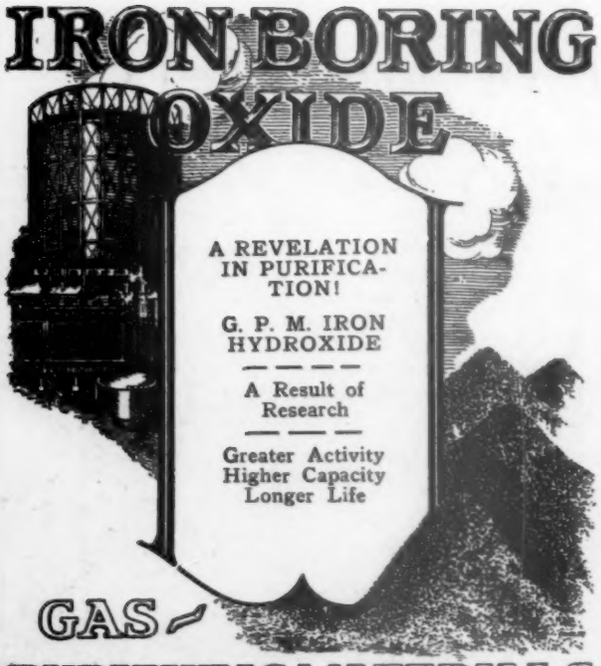

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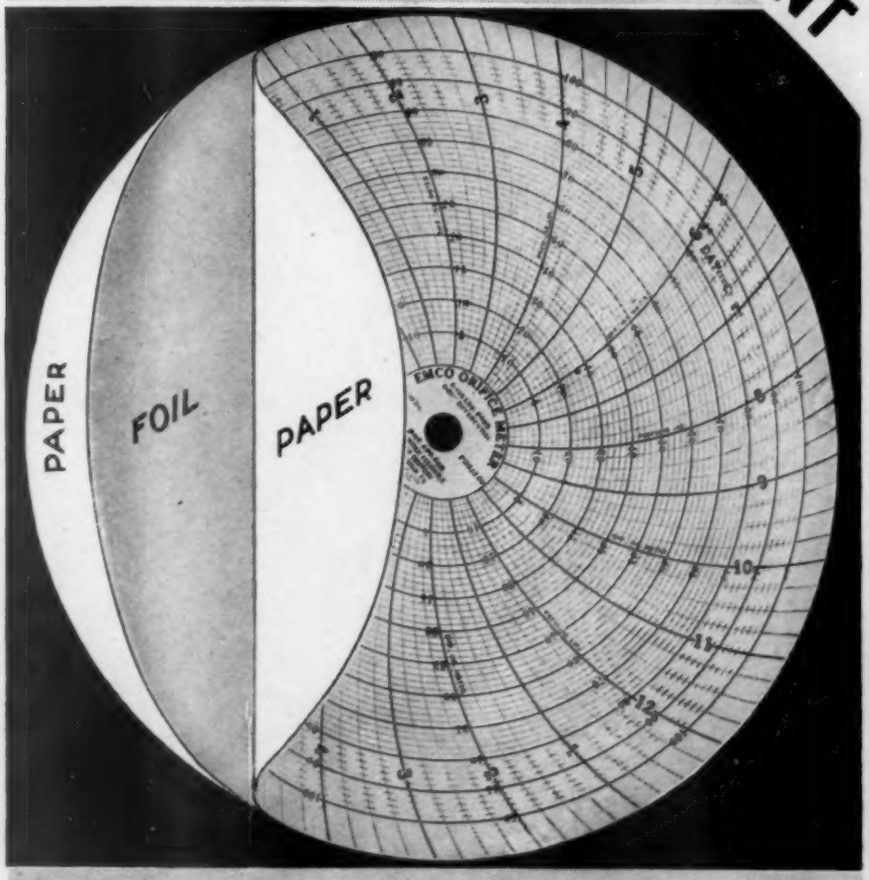

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